HELLER'S GUIDE FOR ICE CREAM MAKERS

Heller's Guide for Ice-Cream Makers

A Practical and Scientific Treatise on the Correct Manufacture of Standard Commercial Ice-Creams and other Frozen Desserts, including 416 Actual Formulas and an Unlimited Number of Potential Formulas, in Orderly and Intelligible Arrangement.

All statutory standards and statutory requirements given herein were those in effect at the time this book went to press

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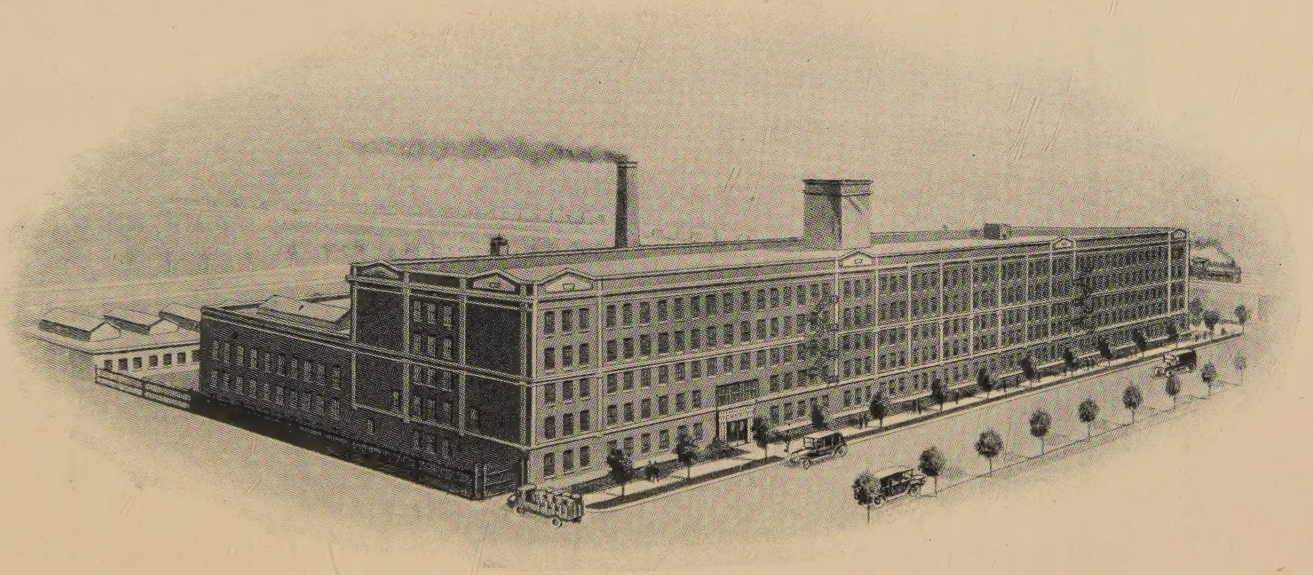
Calumet Ave. at 40th St.
CHICAGO

B. Heller & Company
1927



B. HELLER & COMPANY

Manufacturing Chemists

Chicago, U. S. A.

7th Edition of
Heller's Guide for Ice-Cream Makers
Entirely Rewritten

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Slogan adopted by the
National Association of Ice-Cream Manufacturers

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ARTIFICIAL refrigeration and Ice-Cream were alike unknown to the ancients, though fruit ices antedate the Christian Era at least three centuries.

It was in 1607, during the Renaissance, the awakening after the dark ages, that a method of artificially freezing beverages was developed in Italy, with the aid of kettles revolved in snow to which saltpetre had been added. This was shortly improved upon by the use of salt and snow. By 1690, iced liquors had become extremely common. But only cold wines and flavored Water Ices and Sherbets were produced in this way.

The idea of Milk Ices was, in the thirteenth century, brought by Marco Polo from Japan to Venice, and from there it made its way to Naples, to France and then to England. Nearly 300 years ago, the French chef of Charles I. (of England) produced a Cream Ice. His royal master ordered that it be kept a secret and never made for anybody but himself.

In the later half of the eighteenth century, the Cream Ices were sweetened and generally spaddled (that is, the mix was scraped from the walls of the container with a spatula as fast as it was frozen). Immediately after the American revolution, Cream Ices were produced commercially in New York and first advertised under the name of "Ice-Cream" at $1.00 per quart, a price which prevailed as late as the middle of the nineteenth century. Europe clung, and still clings to sherbets, fruit ices, milk ices, and cream ices. About 1817, a process of freezing by vacuum was discovered, but it made no headway. In 1844, "freezing churns" of various forms were offered by an Englishman named Thomas Masters. To promote their sale he gathered and published all the available recipes for water ices and Ice-Creams, uniformly for a one-quart mix. In 1851, Jacob Fussell, a Baltimore milk dealer, began manufacturing Ice-Cream on a wholesale scale and, notwithstanding

the price of $1.25 per quart, increased his chain of plants over several eastern cities.

A real impetus was given this young industry by the invention of practical methods of artificial refrigeration at the close of our civil war. But Ice-Cream was still an uncertain, soggy mass which "grained" at the slightest provocation and had to be immediately consumed. It required the use of starch, eggs and inordinately rich cream. It cloyed the taste and its cost rendered it prohibitive to many. Ice-Cream was still a crude commodity and a proper balance of ingredients was not understood, if indeed it was considered at all.

Early in the present century, science began to study the improvement of Ice-Cream and of the crude machinery still used in its manufacture. A study of the part played by the various ingredients resulted in the production of Meloine and Mello-Freeze, and a study of methods developed the horizontal freezer. This permitted the elimination of excessive fat and the incorporation of definite quantities of air.

How quickly public appreciation responded is indicated by the following table, which shows the annual production of Ice-Cream at 5-year intervals:

GROWTH OF THE ICE-CREAM INDUSTRY

Year	Production (gallons)	Per capita consumption in U. S. (gallons)
1870 (Estimated)	1,000,000	0.026
1875 (Estimated)	2,500,000	0.056
1880 (Estimated)	4,000,000	0.079
1885 (Estimated)	5,600,000	0.099
1890 (Estimated)	7,100,000	0.11
1895 (Estimated)	8,600,000	0.12
1900 (Estimated)	17,000,000	0.22
1905 (Estimated)	39,000,000	0.46
1910 (U. S. census)	95,450,000	1.04
1915 (U. S. census)	175,224,270	1.77
1920 (U. S. census)	257,820,490	2.44
1925 (U. S. Dept. of Agriculture)[1]	322,729,000	2.80

The per capita consumption of Ice-Cream has increased, from year to year, with a better understanding of the product, until it is now over 2¾ gallons per year for every man, woman and child in America.

The scientific research work in the laboratories of B. Heller & Company had a not unimportant part in the causes for this remarkable growth. Not only Meloine but Mello-Freeze, Snow, delicate flavors and colors especially adapted to the intense cold of freezers and hardening rooms and, not least, B. Heller & Company's original "Guide for Ice-Cream Makers"—all had a historical part in the evolution of the Ice-Cream Industry. This "Guide for Ice-Cream Makers" was for a long time, the only extended treatise available to the average Ice-Cream maker. It was an inspiration to other writers and investigators and a

[1]Press Service, March 12, 1926.

text book, alike of college and factory, so well in advance of the industry at large that it ran through six editions.

In order that the Guide for Ice-Cream Makers may continue to serve as a simple, dependable guide in efficient modern methods of commercial Ice-Cream manufacture, it has now, for this Seventh edition, been rewritten entirely to make it conform with the results of our own laboratory work and that of other recognized scientific institutions. It embodies the best thought and practice of progressive manufacturers and points out the way to show profits from your efforts in modern Ice-Cream making.

The many tables presented are based on accurate determinations by our own scientific staff, co-operating with practical Ice-Cream makers. Where possible, we have adopted the figures of the U. S. Department of Agriculture, either published or unpublished.

The potential Ice-Cream formulas which may be based on the groundwork of complete analytical formulas given, are practically unlimited. They include a variety of combinations of materials to suit the climates and available material of all America. It would be impracticable to give all possible combinations; but we do give from six to twelve formulas for each standard of butter fat, from the 2.40 per cent. Ice-Milk of the Pacific coast to the 20 per cent. mixtures sometimes required by lovers of fat, except 3.50 per cent., for which there are two formulas. Each formula is so presented that batches of any size can be readily calculated, either by weight or by measure. Tables and detailed instructions are given which will enable the manufacturer to calculate for himself any possible combination of ingredients which may have been omitted.

The Guide covers every ordinary problem of the student and of the manufacturer of commercial Ice-Cream.

B. HELLER & COMPANY.

WHAT CONSTITUTES GOOD ICE-CREAM

CONFLICTING STANDARDS

Ice-Cream is a compound of comparatively recent development. In fact it is still in process of evolution from the crude results of haphazard production to the more or less definite results of scientific guidance. Any serious student of Ice-Cream production is still apt to develop refinements of method and of results apparently unlike those developed by another. Under the circumstances, it is natural that Ice-Cream and Ice-Cream standards differ widely according to local requirement, the materials and equipment available, the skill of the manufacturer, and the objects of official regulation.

Formerly many of the most palatable Ice-Creams were made according to secret formulas, and that admitted of the most extravagant claims to account for higher selling prices. In this way the idea became prevalent that the lower the cost of the ingredients, the poorer the product: the more expensive the mix, the finer the Ice-Cream. An air of mystery served to disguise ignorance and protect profits. Absurdly small batches were the rule because primitive methods and equipment, high fat content, and prohibitive prices retarded progress.

But science and practice proceeded, by degrees, to demonstrate that costly ingredients and a higher butter-fat content do not, of themselves, constitute Ice-Cream goodness at all: that a definite ratio of the separate milk solids to the whole mix and to "swell," are of first importance in making a deliciously good Ice-Cream. Costly butter fat may help to expand the waist line and to keep a delicacy sacred for

the use of kings alone; but a scientific balance of all ingredients makes a better and more delicious food of it, lowers the cost, and renders it available to the masses.

Conflicting standards of the federal government and the individual states, merely reflect the state of advancement in the theory and practice of Ice-Cream making at the time of enactment. Each set of regulations usually represents the dominant ideas of those who demand legal standards. There has been a gradual lowering of butter fat from the 18 per cent. originally required to the 7 or 8 per cent. required in some statutes of recent adoption.

The newer statutes recognize the fact that eggs or a high proportion of fat may make a satisfactory "frozen pudding" or "frozen custard," but not necessarily a pleasing, refreshing Ice-Cream. As a matter of fact, 10 per cent. milk fat properly balanced can, with the proper use of Meloine or Mello Freeze, give greater satisfaction to the consumer and insure more repeat orders than an Ice-Cream of 15 or 20 per cent. milk fat without these or with one of their numerous pretended imitations.

Besides, when properly standardized, 10 per cent. Ice-Cream contains more casein (protein) and sugar (carbohydrate). Both of these elements are necessary, in well balanced proportion, for building and repairing the body tissues and for producing energy. The average milk, for the entire country, tests 3.69 per cent. butter fat and 9.04 per cent. milk-solids-not-fat: a proportion of 1 to 2.4. A correctly proportioned Ice-Cream, having 34.1 per cent. total solids, will have the same relative proportion of 10 per cent. butter fat to 24.1 solids not fat, or 1 to 2.4. Ice-Cream that is too fat may be relished as a dessert on rare occasions; but only the Eskimo, the Laplander, and others who subsist largely on fat can use it regularly as part of the diet. Ten per cent. Ice-Cream is recognized by many authorities as being better balanced, a better food, and largely responsible for the increasing importance of Ice-Cream in the American diet.

The product as served must be attractive to the senses: it must be smooth, free of icy and other crystallizations, of good resistance, neither too light nor soggy, and of pleasing flavor and color. It must have stability enough to "stand up" till entirely dispensed, maintaining proper texture and even distribution of ingredients throughout to the end. It must be dependably standardized, uniform from day to day, refreshing and wholesome. Official standards serve their purpose only to the extent that they promote the making of such a product. It is such Ice-Creams that the standards, formulas, and directions in this volume are calculated to produce.

CORRECT COMMERCIAL STANDARDS.

Ice-Cream is a dairy product. Only milk products are used as a base, with sugar, stabilizer, flavor, color, and Meloine or Mello-Freeze added. Water lost in condensation or drying can, of course, be restored.

In well balanced Ice-Cream there is sufficient fat to give it the pleasing flavor and aroma of a dairy product; sufficient serum solids

(milk solids not fat) to give it body and resistance and to maintain nature's volume of fat to protein; sufficient sugar and other flavoring matter to render it palatable; sufficient air to give it dishing quality and to make it edible. If any one of these essentials is either deficient or in excess, the correct balance is destroyed and the quality of the Ice-Cream suffers accordingly.

The fat content of a good commercial Ice-Cream ranges somewhere between the 7 per cent. at present required by Massachusetts and 14 per cent. at present required in inter-state commerce and nine of the states. With the correct use of Meloine or Mello-Freeze, however, a smooth Ice-Cream can be made even with 4 per cent. of milk fat, supported by such skim solids (serum solids) as the table on page 17 provides for.

Excessive fat provides excessive fuel without providing the bone, muscle, and sinews to be driven. It is like increasing the fire under a boiler without providing an outlet for the increased vapor and without strengthening the seams and rivets. Fat Ice-Creams have their uses, but they are more easily defended in winter than in summer. When Ice-Creams were, in effect, mere sweetened fat, physicians opposed their use, under any circumstances, by the sick or convalescing. Now that many manufacturers are not using more than 10 per cent. fat, physicians encourage its use for nourishment as well as to subdue fever. (The Chicago Health Department recommends it as a food for health.)[1]

Human appetite, like that of other creatures, can generally be trusted to select instinctively the food the system requires. It is enlightening, therefore, to see what the inhabitants of America prefer.

Ice Cream Standard Selected By The Consumer

Standard fat content (per cent.)	Number of states which adopted it	Population 1924 calculated from census of 1920	Consumption of Ice-Cream in 1924 (gallons)	Per capita consumption in 1924 (gallons)
7	1	4,046,732	5,783,000	1.43
8	19	69,540,889	118,860,000	1.71
10	10	14,522,645	22,988,000	1.58
12	5	12,425,269	22,305,000	1.80
14	11	8,314,545	10,387,000	1.25
No Standards	3	2,355,899	1,241,000	0.53
..	49	111,205,979	181,564,000	1.63

This indicates that the inhabitants of this country have, by a clear majority of nearly fourteen million (13,937,900), declared themselves, through their legislatures, in favor of an 8 per cent. standard for Ice-Cream.

It indicates that the advocates of all other standards combined (41,665,090) number 60 per cent. less than the advocates of the 8 per cent. standard alone.

It indicates that the advocates of the 14 per cent. standard number less than those of any other standard except that at the other extreme.

[1] "Ice-Cream and Health," Dr. H. N. Bundesen, Commr. of Health, Chicago, June 23, 1925.

A logical deduction would be that those in very active occupations and those in cold climates should be required to eat Ice-Cream of 11 to 14 per cent. butter-fat content, and that those of inactive habits and those in comparatively warm climates should be required to eat Ice-Cream testing 7 to 10 per cent. butter fat. The Ice-Cream maker, however, must be governed by legal standards.

The milk fluid which holds the butter fat in suspension, is known as the milk serum. The solids-not-fat of this serum are known as the serum solids. About 54 per cent. or somewhat over half of these serum solids is natural milk sugar (lactose). The milk sugar constitutes 4.88 per cent. of the average milk.

The serum solids content of Ice-Cream is not regulated by statute except in the most recent enactments, and in those states the required percentage agrees with the figures in our table as given on page 17.

Authoritative tests[1] have shown that at least 12 per cent. serum solids are needed when the milk solids alone are depended upon to produce smooth texture and good body. Even then there must also be at least 12 per cent. milk fat. But 12 per cent. serum solids includes the approximate point of saturation for the lactose. It may, in fact, be termed the "saturation point" for serum solids in Ice-Cream.[2] When the saturation point is reached, especially with other solids present and with fluctuating temperature, the lactose crystallizes, and this is one of the causes of the much discussed condition known as "sandy Ice-Cream." Furthermore, disagreeable cooked flavor, condensed flavor, and the flavor of lactose are apt to become more and more noticeable with 12 or more per cent. serum solids. It is therefore impossible to use all the serum solids that would be necessary to provide smooth texture and good body. The problem cannot be solved by adding casein, as that too would injure the flavor.

More recently, the New York Experimental Station has determined that no proportion, not even 30 per cent., of serum solids alone is enough to harden into a smooth Ice-Cream.[3] It is the correct balance of all ingredients, supported by Meloine, or Mello-Freeze, that makes a smooth product.

The use of Meloine or Mello-Freeze may therefore be said to be a physical necessity. But their use has the further merit of ripening the mixture without costly and dangerous storage and of tending to prevent "sandy Ice-Cream" and other forms of crystallization.

Twenty per cent. total milk solids (fat and serum) is, by common consent, considered a good commercial Ice-Cream. But it would be neither logical nor economical to adjust the Ice-Creams of several standards so as to have the same serum solids. The one which has the highest proportion of serum solids is the one which must logically have the lowest proportion of milk fat. That is the so-called "Ice-Milk" with a fat standard of 2.40 per cent. Since 12 per cent. serum solids constitutes the danger point, 11-2/3 per cent. has been fixed as the logical requirement for the leanest mix, allowing a safe margin for daily variations.

1. Prof. A. S. Ambrose, Dairy Manufacturers, U. of Ill.
2. Prof. R. C. Fisher, Dairying, Conn. Agric. Coll.
3. Prof. A. C. Dahlberg, convention, N. Y. Ice-Cr. Mfrs. Assn., Buffalo, 1925.

At the other extreme, we find Ice-Cream with a fat content as high as 20 per cent. sometimes used. In the table of Milk and Cream Standards, pages 38 and 39, we find that 20 per cent. cream has 7.93 per cent. serum solids. Since the combined milk solids of this cream are ample without the addition of more serum solids, 7.93 has been fixed as the logical requirement for the fattest mix.

Graduating all the serum solids from 7.93 for 20 per cent. butter fat to 11.67 per cent. for 2.40 per cent. butter fat, gives the rate for each of the intervening fat percentages, or natural Ice-Cream standards, as tabulated in the second column of the table on page 17.

This graduation fixes the natural milk solids not fat (or serum solids) of statutory Ice-Cream of various states as follows:

Butter-fat content	Serum solids content
6 per cent.	10.91 per cent.
7 per cent.	10.69 per cent.
8 per cent.	10.48 per cent.
9 per cent.	10.27 per cent.
10 per cent.	10.06 per cent.
12 per cent.	9.63 per cent.
14 per cent.	9.21 per cent.

The moisture content of the mix is, in every case, ample to maintain the lactose content in perfect solution.

The graduation from 7.93 (for 20 per cent. butter fat) to 11.67 (for 2.40 per cent. butter fat) may seem arbitrary. However, it places the 10 per cent. almost exactly where standard practice has long considered that it belongs. Besides, we have confirmed our theory in actual tests for flavor, body, and texture, finding that the serum solids content, as tabulated in the second column of the table on page 17, is actually the best (optimum) relative proportion. To increase the proportion would be dangerous in the lean mixtures and wasteful in the fat mixtures. To lower them would place an unreasonable burden on Meloine or Mello-Freeze.

The correct proportion of sugar varies with the percentage of butter fat in the mixture. It is an error to assume that an Ice-Cream should have 14 per cent. or any other fixed quantity of cane sugar, regardless of all other ingredients. Exhaustive experimentation leads us to fix 14½ pounds granulated sugar in the 100-pound mix as the most generally pleasing for a correctly proportioned Ice-Cream of 5 per cent. butter fat. Similar experiments demonstrate that 12 pounds impart the most generally preferred degree of sweetness for an Ice-Cream containing 20 per cent. butter fat. Bakers and pastry cooks have the same experience: namely, that the more fat is used, the lower must be the sugar content or the product will cloy the taste.

Using these findings as a basis, we have graduated the sugar requirement for all standards, from 14.93 pounds per hundred for so-called Ice-Milk to 12 pounds for the 20 per cent. product of the lovers of fat. As may be seen in the third column of the table on page 17, this fixes

the natural sugar requirement of statutory Ice-Cream as follows:

Butter fat content	Cane sugar content
6 per cent.	14.33 per cent.
7 per cent.	14.17 per cent.
8 per cent.	14. per cent.
9 per cent.	13.83 per cent.
10 per cent.	13.67 per cent.
12 per cent.	13.33 per cent.
14 per cent.	13. per cent.

These findings have been confirmed by the experience of observing manufacturers everywhere and will be regarded, by the careful, as having an important bearing on the texture, taste, and cost of the mix. To exceed these proportions, is wasteful and may even endanger the product: to fall below them, may prove a costly economy. It is not safe to build up the total solids by increasing the proportion of sugar provided for in our tables and formulas. To do so will make the Ice-Cream difficult to harden and more difficult to keep hard in the retailer's cabinet.

The hydrophilic[1] colloids content (gelatin and Meloine) is based on the total solids. A "thin" mixture requires more gelatin to absorb excess moisture than does a "thick" mixture. The proportion of Meloine or of Mello-Freeze is alike for all commercial mixtures; but the use of a fixed quantity of gelatin, regardless of the total solids content, is as unreasonable as a fixed proportion of serum solids or of sugar would be. The fourth column of the table on page 17 shows the relative proportion of colloids, graduated according to common experience. The table on page 60 shows how that proportion must be divided between gelatin, Meloine and "Snow."

The table assumes the use of gelatin of high test and good quality. If an Ice-Cream of less than 8 per cent. butter fat is to be made in or for one of those states which restrict the proportion of colloids to 0.5 per cent., then the gelatin must be of sufficiently finer quality so that the reduced proportion may still be entirely effective. The higher the jell strength of the gelatin the less percentage needed.

The table on page 60 assumes that the mix using Meloine will be stored not more than 16 hours. In order to store for longer periods than that, the quantity of Meloine must be cut one-half.

Starch, eggs, and other similar items are no longer considered a part of good Ice-Cream. Their place is in pastry or even in frozen puddings, but not in a product officially defined as a dairy product.

The total solids of the statutory Ice-Creams can thus be graduated, by easy and logical stages, by the table which follows, with any slight changes which might be made to suit the manufacturer's individual desires:

[1]Hydrophilic colloids are those colloids which absorb such great quantities of water that a relatively insignificant portion suffices to jell the mixture.

Butter fat content	Total solids content
6 per cent.	31.76 per cent.
7 per cent.	32.35 per cent.
8 per cent.	32.94 per cent.
9 per cent.	33.55 per cent.
10 per cent.	34.17 per cent.
12 per cent.	35.38 per cent.
14 per cent.	36.61 per cent.

This leaves ample moisture, in each case, to maintain the lactose in perfect solution.

The fifth column of the table on page 17 shows that the total solids range naturally from 29.65 per cent. for Ice-Milk to 40.04 for a product with a butter-fat content of 20 per cent. With these standards, the manufacturer can readily obtain the drawing swell corresponding to the weight in the next to the last column.

Air is as necessary a part of good Ice-Cream as it is of good bread and cake. It is beaten into the mix in freezing. Without it, the product would have a heavy, soggy body and would resist melting in the manner that solid ice resists it. To exclude air completely, it would be necessary to freeze without the revolving paddles in the freezer. This would cause the mixture to freeze into a hard, solid mass, impossible to remove from the freezer or to dispense with dippers and spoons.

It is a mistake to believe that air is worked into the Ice-Cream mix to inflate the product for greater profit. When the swell is in proportion to the milk solids (see page 17), it can be spoken of only as the normal, natural condition of good Ice-Cream, regardless of the weight.

The manufacturer must be governed strictly by the requirements of his state laws, sometimes amplified by local ordinances and regulations. Such of the Ice-Cream as is shipped outside the state in which it was made, enters into inter-state or foreign commerce, and thereby becomes subject to the standards and requirements established by the U. S. federal government. Furthermore, the statutes and standards of the state into which shipment is made must be observed. Wherever food laws and regulations differ, the more stringent always governs. No state, however, has jurisdiction over Ice-Cream shipped through between points both of which are outside the state. Knowing the legal requirements, the manufacturer can adjust himself to local conditions of supply, demand, and competition.

The following table shows merely the naturally correct relative proportion of Ice-Cream ingredients at any given butter-fat content. The present requirements of federal and state laws are tabulated on pages 397-399. Having decided the most expedient butter-fat percentage of his proposed Ice-Cream the prudent manufacturer should refer to the following table to determine the natural proportion of other ingredients necessary to produce the best possible mix of that standard without waste. The detailed formulas for each of those standards are on pages 124 to 192. Neither the table nor the formulas may be construed as displacing any standards or requirements fixed by law or local regulation.

Outline of Ice-Cream Formulas by Natural Standards

Showing the Elements and Proportions Required in Good Commercial Ice-Cream of Any Desired Fat Content.

Milk Fat or Butter Fat (Per Cent. by Weight)[1]	Milk Solids Not Fat (Per Cent. by Weight)[2]	Granulated Sugar Solids (Per Cent. by Weight)[3]	Gelatin, Mdoine or Mello-Freeze, Flavor and Color Solids (Per Cent. by Weight)[4]	Total Solids (Per Cent.)[5]	Moisture in Ingredients or Added as Water (Per Cent. by Weight)	Calculated Weight Per Gallon of Unfrozen Mix at 68 Degree F. (Pounds)[6]	Calculated Weight Per Gallon of Frozen Ice-Cream (Pounds)	Approximate Quantity of Finished Ice-Cream for Each Gallon of Mix
2.40	11.67	14.93	0.64	29.64	70.36	9.206	5.09	1 gal., 6½ pts.
3.50	11.44	14.76	0.60	30.30	69.70	9.177	5.03	1 gal., 6½ pts.
4	11.33	14.67	0.58	30.58	69.42	9.168	5	1 gal., 6½ pts.
5	11.12	14.50	0.54	31.16	68.84	9.143	4.94	1 gal., 6¾ pts.
6	10.91	14.33	0.52	31.76	68.24	9.123	4.89	1 gal., 7 pts.
7	10.69	14.17	0.50	32.36	67.64	9.101	4.83	1 gal., 7 pts.
8	10.48	14	0.46	32.94	67.06	9.08	4.78	1 gal., 7¼ pts.
9	10.27	13.83	0.45	33.55	66.45	9.058	4.73	1 gal., 7¼ pts.
10	10.06	13.67	0.43	34.16	65.84	9.037	4.67	1gal., 7½ pts.
11	9.84	13.50	0.42	34.76	65.24	9.016	4.62	1 gal., 7½ pts.
12	9.63	13.33	0.40	35.36	64.64	8.995	4.57	1 gal., 7¾ pts.
13	9.42	13.17	0.39	35.98	64.02	8.974	4.52	1 gal., 7¾ pts.
14	9.21	13	0.37	36.58	63.42	8.953	4.48	2 gals.
15	8.99	12.83	0.36	37.18	62.82	8.933	4.43	2 gals., ¼ pt.
16	8.78	12.67	0.34	37.79	62.21	8.912	4.38	2 gals., ¼ pt.
17	8.57	12.50	0.33	38.40	61.60	8.891	4.34	2 gals., ½ pt.
18	8.36	12.33	0.32	39.01	60.99	8.869	4.29	2 gals., ½ pt.
19	8.14	12.17	0.30	39.61	60.39	8.85	4.25	2 gals., ¾ pt.
20	7.93	12	0.29	40.22	59.78	8.83	4.20	2 gals., ¾ pt.

1. Good commercial Ice-Cream has a butter fat or milk fat content of 7 or 8 to 14 per cent. 2.40 per cent. is the statutory "Ice-Milk" of California and Washington: 3.50 per cent. covers the statutory requirement of "Milk-Ice" in Tennessee. From 16 per cent. upward, the fat becomes increasingly intolerable. That which falls below standards is sometimes classed with sherbets, no matter what the fat content may be.

2. Technically known as "Serum solids." When they fall below 9.50 per cent., it becomes more and more difficult to obtain satisfactory yield in reasonable time, unless the loss is compensated by a corresponding gain in the fat content and a corresponding reduction of the sugar. Serum solids cannot safely exceed 12 per cent., in commercial mix, without risk of injuring the flavor and of causing soggy body and "sandy" or "grainy" Ice-Cream, due to crystallization of the lactose or natural milk sugar. The addition of more casein, without the milk sugar, injures the flavor and may cause what is known as doughy Ice-Cream. In order to allow for variations in the milk supply, from day to day, it is better to draw the line at 11.67 per cent. milk solids not fat.

3. As the proportion of butter-fat increases, the quantity of sugar required for body and for sweetening is lessened. A sugar allowance satisfactory in an 8 per cent. Ice-Cream would be too sweet in one of 14 per cent. butter fat. Furthermore, sugar tends to retard the "swell" unless its proportion is lowered with the decreasing milk-solids-not-fat. To increase the solids in the sweetening agent, in the lean mixes, without changing the degree of sweetness, use the tables on page 19.

The column shows "sugar solids," which are equivalent to the following whole sugar (in pounds or per cent.):

2.40, 15.00;	6, 14.40;	9, 13.89;	12, 13.39;	15, 12.88;	18, 12.39;
3.50, 14.83;	7, 14.23;	10, 13.73;	13, 13.23;	16, 12.73;	19, 12.22;
4, 14.73;	8, 14.06;	11, 13.56;	14, 13.06;	17, 12.56;	20, 12.05.
5, 14.56;					

4. Assumes a high-test and high-quality gelatin in order to add a minimum of micro-organisms to the mix. A low-testing gelatin requires a relatively larger proportion to do the same work and is apt to affect the flavor. The table takes into consideration the limitation of gelatin, gums, and Meloine or Mello-Freeze by statute, in some states, to 0.5 per cent. In states where that does not apply, the Ice-Cream maker must be governed accordingly. The column shows "solids": the actual weight of the entire ingredients is shown in the formulas and on page 60.

5. With low butter fat it is difficult to provide sufficient total solids for the stability of a good commercial Ice-Cream. To overcome this difficulty, the solids can be raised to the more desirable total of 33.50 per cent. by substituting a small proportion of corn sirup or of refined corn sugar for part of the granulated cane sugar, as illustrated in the tables on page 19. Total solids will seldom exceed 37.50 per cent., in commercial mix. If they do exceed 37.50, the proportion of gelatin must be reduced: otherwise the mix is apt to stiffen in the pipes, impeding the flow or stopping it entirely. The table on page 20 should govern in compounding commercial mixes of 16 per cent. butter-fat and upward.

6. Using the specific gravity figures of 0.930 (in terms of water at 68° F. as unity) for milk-fat, 1.616 for serum solids, 1.580 for granulated sugar, 1.010 for colloids, flavor, and color; 8.32162 lbs. as the weight of 1 gal. water; and 1.0028 as the volume of 1 c.c. water at 68° F. If the legal standard fixes a weight per gallon unlike the weight here given, then the over-run must be adjusted to the legal weight.

WHEN THE MIX IS LOW IN MILK SOLIDS

Sufficient body should be provided in commercial Ice-Cream to make it "stand up" or maintain its "swell" after proper whipping. Either Meloine or Mello-Freeze may be depended upon to do its part in this respect, but the manufacturer should make certain that his mix carries the proper proportion of solids. The most satisfactory proportion of total solids in a well-balanced Ice-Cream ranges from 33.5 to 37 per cent.

This makes it desirable to increase the solids in "Ice-Milk," "Milk-Ice," and the lean mixes of Ice-Cream given in the table on page 17. The serum solids cannot safely be increased, in commercial practice, beyond 11.67 per cent., for the added solids would raise the milk sugar (lactose) content beyond the danger point for the production of sandiness, and also endanger the flavor. Casein and starch cannot be used to make up the deficiency; they injure the flavor to an extent that cannot be masked with an excess of vanilla or other flavor.

Under the circumstances, the use of corn sirup or refined corn sugar to replace part of the granulated sugar may become a physical necessity. This will not affect the flavor if less than one-half the sugar is replaced with glucose or refined corn sugar. Neither glucose nor refined corn sugar is less wholesome than sucrose. Both have a much lower sweetening power than granulated cane sugar, though the moisture-free solids may nearly approach those of cane sugar (see table on page 52).

By replacing a calculated proportion of the sugar with sufficient corn sirup or refined corn sugar to run the total solids of the entire Ice-Cream mix up to 33.5 per cent., the degree of sweetness can be maintained unchanged. Thus the whole mix is improved in quality, texture, and stability, without sacrificing flavor, and either Meloine or Mello-Freeze, whichever is preferred, will then make a smoother Ice-Cream of it.

Therefore, the sugar content in the lean mixes can be modified, to the advantage of the consumer, in accordance with the following tables. In other respects, the table on page 17 should govern.

Correct Use of Corn Sirup with Granulated Cane Sugar

For Better Body and Texture in Lean Mixtures.

Butter-Fat (Per Cent.)	Desired Degree of Sweetness, Calculated in Granulated Sugar Solids (Per Cent.)	Solids Desired in Sweetening Ingredients to Make Total Solids 33.50 Per Cent.	Ingredients For Sweetening	For the 100-Pound Mix		For the 5-Gallon Mix	For the 100-Gallon Mix
				Pounds	Solids (Per Cent.)		
2.40	14.93	18.98	Granulated sugar	13.70	13.64	6 lbs., 5¼ oz.	126 lbs., 9 oz.
			Corn sirup	6.46	5.34	2 pts.	4 gals.,7¾ pts.
3.50	14.76	17.96	Granulated sugar	13.80	13.74	6 lbs., 5½ oz.	126 lbs., 10 oz.
			Corn sirup	5.10	4.22	1¾ pts.	4 gals., 1¾ pts.
4	14.67	17.72	Granulated sugar	13.76	13.70	6 lbs., 5 oz.	126 lbs., 7 oz.
			Corn sirup	4.86	4.02	1½ pts.	3 gals., 5¾ pts.
5	14.50	16.93	Granulated sugar	13.79	13.73	6 lbs., 5 oz.	126 lbs., 5 oz.
			Corn sirup	3.87	3.20	1¼ pts.	2 gals.,7¾pts.
6	14.33	16.14	Granulated sugar	13.81	13.75	6 lbs., 5 oz.	126¼ lbs.
			Corn sirup	2.89	2.39	1 pt.	2¼ gals.
7	14.17	15.36	Granulated sugar	13.85	13.79	6 lbs., 4¾ oz.	126 lbs., 1 oz.
			Corn sirup	1.90	1.57	½ pt.	1 gal., 3½ pts.
8	14.	14.57	Granulated sugar	13.88	13.82	6 lbs., 4¾ oz.	126 lbs.
			Corn sirup	.91	.75	¼ pt.	6 pts.

Correct Use of Refined Corn Sugar with Granulated Cane Sugar

For Better Body and Texture in Lean Mixtures.

Butter-Fat (Per Cent.)	Desired Degree of Sweetness, Calculated in Granulated Sugar Solids (Per Cent.)	Solids Desired in Sweetening Ingredients to Make Total Solids 33.50 Per Cent.	Ingredients For Sweetening	For The 100-Pound Mix		For The 5-Gallon Mix	For The 100-Gallon Mix
				Pounds	Solids (Per Cent.)		
2.40	14.93	18.98	Granulated sugar	9.98	9.94	4 lbs., 10¾ oz.	93 lbs., 5 oz.
			Refined corn sugar	9.08	9.04	4 lbs., 3¾ oz.	84 lbs., 14 oz.
3.50	14.76	17.96	Granulated sugar	10.86	10.81	4 lbs., 15¾ oz.	99¾ lbs.
			Refined corn sugar	7.18	7.15	3¼ lbs.	65 lbs., 14 oz.
4	14.67	17.72	Granulated sugar	10.96	10.91	5 lbs., 1¼ oz.	101 lbs., 10 oz.
			Refined corn sugar	6.84	6.81	3 lbs., 1¼ oz.	63 lbs., 7 oz.
5	14.50	16.93	Granulated sugar	11.55	11.50	5 lbs., 5¼ oz.	106 lbs., 10 oz.
			Refined corn sugar	5.45	5.43	2 lbs., 8¼ oz.	50 lbs., 5 oz.
6	14.33	16.14	Granulated sugar	12.15	12.10	5 lbs., 9¼ oz.	111 lbs., 9 oz.
			Refined corn sugar	4.06	4.04	1 lb., 13¾ oz.	37¼ lbs.
7	14.17	15.36	Granulated sugar	12.76	12.70	5 lbs., 13¼ oz	116 lbs., 10 oz.
			Refined corn sugar	2.67	2 66	1 lb., 3½ oz.	24 lbs., 6 oz.
8	14.00	14.57	Granulated sugar	13.36	13.30	6 lbs., 1¼ oz.	121 lbs., 9 oz.
			Refined corn sugar	1.28	1.27	9¼ oz.	11 lbs., 10 oz.

This lowers the proportion of colloidal stabilizers needed, and the quantities given for the 8 per cent. mix, in the tables on pages 17 and 60, should then be used for all the above.

HOW TO REDUCE TOTAL SOLIDS IN HIGH-FAT MIXES

The following table gives modified proportions of the high-fat Ice-Cream that is not intended for immediate consumption, especially if the mix is put through sanitary piping. Under other conditions and for lower fat percentages, the table on page 17 should govern.

When Commercial Ice-Cream is to Have a Butter Fat or Milk Fat Content of (Per Cent. by Weight)	Then the mix that is not for immediate consumption should have the other ingredients as below					Weight per Gallon of Unfrozen Mix, by Calculation in Lbs. at 68° F.	To be Drawn When Swell is at (Per Cent.)	Calculated Weight per Gallon of Frozen Ice-Cream (Pounds)
	Milk Solids Not Fat (Per Cent. by Weight)	Granulated Sugar Solids (Per Cent. by Weight)	Gelatin, Meloine, or Mello-Freeze, Flavor, and Color Solids (Per Cent. by Weight)[1]	Total Solids (Per Cent.)	Moisture in Ingredients or Added as Water (Per Cent. by Weight)			
16	8.67	12.48	0.35	37.50	62.50	8.89	102.60	4.39
17	8.21	11.94	0.35	37.50	62.50	8.86	102.70	4.37
18	7.75	11.40	0.35	37.50	62.50	8.82	102.80	4.35
19	7.28	10.87	0.35	37.50	62.50	8.77	102.85	4.32
20	6.82	10.33	0.35	37.50	62.50	8.74	102.95	4.30

1. See table, page 60, for 15.5 per cent. butter fat, which governs these figures.

CHOOSE WITH CARE.

The price obtained for the finished product should be governed by the cost of ingredients. More often, however, competition governs the price and the selling price, in turn, governs the cost and quality of ingredients.

Costs must indeed be held down, but not at the expense of quality. Whatever standard may be adopted for a product, good business practice demands that the quality does not fall below that standard or below the quality the consumer may be justified in expecting for his money. Efficient working conditions should be looked to for any necessary elimination of waste, in order that the standard of the product may gain friends instead of losing them.

It is cheaper to buy good milk, cream and butter than to buy low-priced grades that must be "neutralized." The taste of "neutralized" acidity is hard to disguise and harder to justify. It is cheaper to buy pure ingredients of definite strength than to load the product with bacteria which may serve to liquefy it when it should be firm and hard and injure the wholesomeness of the product. It is cheaper to insure smoothness and stability with an ounce of Meloine or of Mello-Freeze than to litter up a lot of store rooms with aging mix that is always on the verge of souring.

It is important that the Ice-Cream maker obtain his supplies from reliable sources. No formula computed for ingredients of a given standard can be correctly compounded with anything that differs materially from the standard.

MILK AND CREAM

The base of Ice-Cream of any kind must be clean, fresh, sweet milk, or some sweet, wholesome product derived from it.

Whole milk is a perfect food, lacking only iron. It contains all five of the vitamins and is the richest and best source of calcium for body building. It varies materially in quality, percentage of milk-fat (more often termed "butter fat") and of other solids contained in it. This is chiefly owing to characteristics of the different dairy cows. The following table gives the average analysis of the whole milk of each of the leading dairy breeds; also the average market milk of the United States, regardless of breeds. In comparison, and possibly for use, three other species are added.

Aside from the difference between breeds there is a marked difference between strains and individuals of the same breed, and even within the individual at different ages, at different stages of the lactation period, and under different feeding systems. A drop in atmospheric temperature raises the fat percentage at the rate of about 0.15 per cent. for every 10 degrees F., with a corresponding check in the milk flow. Even different milkers may get a different percentage of milk fat from the same cow; for the last scant strippings of each milking, which a careless milker would be apt to lose entirely, are the richest in fat.

It is apparent therefore, that the milk of one dairy herd may easily have a value far greater than that of another. All is market milk and the Ice-Cream maker who can contract for the unskimmed, rich output of a Jersey or Guernsey herd, or of grade cows of these breeds, at the market price of average milk, may be fortunate indeed. The butter-fat average of all milk is calculated, throughout this work as 3.69 per cent. For practical work, the simpler figure of 3.7 per cent. may safely be used.

Average Milk Analyses of Different Dairy Breeds[1]

(For Federal and State Milk Standards see pages 396 and 398-399; for the Composition and Weight of all Standards of Milk and Cream, see pages 38 and 39).

BREED	Butter Fat (Per Cent.)	Solids-Not-Fat (Serum Solids) (Per Cent.)	Total Solids (Per Cent.)	Ratio of Solids-Not-Fat to Butter Fat	Average Per Cent. Acid, by Titration 2
Holstein-Friesian	3.32	8.46	11.78	2.55:1	0.136
Dutch Belted	3.40	8.91	12.31	2.62:1	.....
Ayrshire	3.62	8.84	12.46	2.44:1	0.123
Brown Swiss	3.62	8.99	12.61	2.48:1	.....
Red Polled	3.67	8.99	12.66	2.45:1	.....
Shorthorn	3.70	8.91	12.61	2.41:1	0.18
Devon	3.72	9.21	12.93	2.47:1	.....
Alderney	3.81	9.79	13.60	2.57:1	.....
French Canadian	4.00	9.32	13.32	2.33:1	.....
Guernsey	4.53	9.08	13.61	2.00:1	0.139
Polled Jersey	4.67	9.26	13.93	1.98:1	.....
Jersey	5.12	9.27	14.39	1.81:1	0.162
Average of all market milk	3.69	9.04	12.73	2.45:1	0.147
Goat	3.54	8.26	11.80	2.33:1	.....
Indian Buffalo (Brahma)	6.77	9.47	16.24	1.40:1	.....
Ewe	7.17	11.35	18.52	1.58:1	.....

Ice-Cream manufacturers should buy milk and cream on the fat basis and pay for it accordingly. Milk may then be separated and the cream used to standardize the milk (see pages 103-107) by restoring sufficient cream to meet the legal requirements or to fit the requirements of the formula used.

Skim-milk is milk from which substantially all the milk fat has been removed, usually by means of centrifugal separators. From 0.025 to 0.05 per cent. of fat is all that remains in it. Local regulations often require that it contain not more than 1 per cent. milk fat, that it be labeled "Skim-milk," and that it be delivered in distinctly colored containers. The purpose of such regulations is to forestall the possible claim that it was being sold as skim-milk when a dealer has milk in his possession which falls below the local standard of whole milk. Its use with cream or butter in standardizing the Ice-Cream mix, is entirely legitimate and has not, as such, any bearing on the quality of the finished product, providing only that the moisture content and the solids not fat (serum solids) contained in the skim-milk are properly considered in compounding the mix. Surplus skim-milk is a serious problem in many milk plants during spring and early summer and much of it then goes to waste. The efficient manufacturer can often reduce costs considerably by availing himself of this, changing his Ice-Cream

1. Adapted from John W. Gowen, Journ. Agric. Res., Vol. XVI, No. 3.
2. T. J. McInerney, Journ. Diary Sci., Vol. III, No. 3. Information available for only five breeds.

formula to suit the available product. This is an easy matter with the aid of the formulas in this book, since any of the combinations formulated under a given standard can be made to produce similar results.

Unless transportation costs or other emergencies render the use of skim milk impossible, it should be used in preference to water. It is usually a cheap source of serum solids and need not contain any of the impurities sometimes added with water. However, when not available in liquid form, the condensed and powdered forms are an excellent substitute. The hygienic laboratory of the U. S. Public Health Service[1] has demonstrated that the combination of butter, powdered skim-milk, and water contains growth-promoting properties equal to those of fresh and pasteurized milk: that is to say, the process of drying skim milk by the spray process does not injure the water-soluble vitamin. Nevertheless, the flavor of an Ice-Cream made without added water should be superior to that which contains an appreciable proportion of it.

Cream is ordinarily the product of distant dairy farms where transportation charges prohibit the shipment of whole milk. It is economical of space in the factory cooler and plays an important part in present-day Ice-Cream making. The present U. S. standard is 18 per cent. butter fat; but efficient management demands a much higher test because 36 per cent. cream costs no more for transportation, and the same quantity of butter fat in 36 per cent. cream uses only half the cans, half the handling, half the washing, and half the cooler space of cream that tests 18 per cent. butter fat.

Frozen milk and cream, or rather that which has been frozen, due to weather conditions, should, either before or after mixing, be put through a homogenizer, viscolizer, emulsifier, or blender. In frozen milk or cream the fat emulsion is destroyed and the condition of the casein is injured.

EASY WAY OF STORING JUNE CREAM FOR SUMMER CONSUMPTION

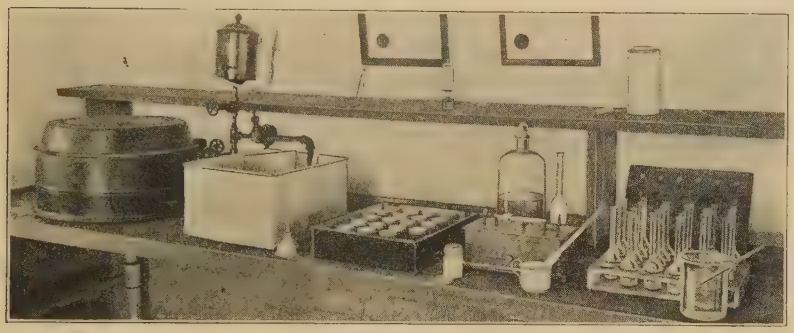
When cream is frozen for storage, it is advisable to use such as contains at least 40 per cent. milk fat, not more than 0.18 per cent. acidity, and which is of good flavor. It should be pasteurized, cooled, then put into 5-gallon Ice-Cream packer cans, filled to within 2½ or 3 inches of the top, covered, sharp frozen at 5 degrees F., and held at as low a temperature as possible. If used without homogenizing, the solids separate sooner and the liquid part is more apt to crystallize: therefore, it should never be used without homogenizing.

Frozen cream develops bitterness, due to the action of bacteria or bacterial enzyms which have survived pasteurization. Owing to this condition and also to the destruction of the emulsion of the fat, frozen cream should always be mixed with normal cream in a proportion not to exceed 50 per cent. Thoroughly agitate the cream that has been frozen before proportioning it with normal cream. Then homogenize.

1. J. M. Johnson: Reprint 690, Public Health Reports, U. S. Treasury Dept., 1921.

TESTING MILK AND CREAM FOR FAT CONTENT[1]

The buyer must protect himself by means of the Babcock or an equivalent test to see that he gets all that the law and his contract provide for. The least turn of a thumb screw or the slightest change in pulley speed may separate a cream worth appreciably more or less money, a cream which would require entirely different standardization to make a creditable Ice-Cream.



Necessary equipment for testing milk and cream for butterfat content.

Correct sampling is the first step in making a reliable butterfat test. The sample must contain the same proportion of fat as the whole quantity of milk to be tested. Since the butterfat is the lightest part of milk or cream, more of it will be found toward the top than at lower levels. For this reason, milk or cream that is to be tested must be thoroughly mixed before taking a sample of it. This may be done by pouring the whole quantity from one vessel into another, several times, or by moving a milk stirrer or a dairy dipper violently down and up until satisfied that the milk is uniform at all levels. The milk stirrer is a heavy wire, bent to form a handle at the upper end, with a flat disk at the bottom, as wide as will enter the neck of the cans. Take ¼ to ½ pint for each sample.

If the sample is not to be tested immediately, it should be kept in a jar with glass stopper or screw top, to prevent evaporation. Such a jar stands on the shelf in the picture shown above.

It is hard to obtain a reliable sample from thick, lumpy or frozen cream.

Souring and curdling can be prevented for a week by adding a large tablet of corrosive sublimate to a 1-pint sample.

Immediately before testing, the sample of milk or cream should be brought to room temperature, or between 55 and 70 degrees F., and thoroughly mixed by pouring it forth and back, from one jar to another, until the fat is evenly distributed. If there are granules of butter in the milk, it must be held at 100 degrees F. until they are completely melted: then mix as stated.

1. Adapted from Gregory and Hammond, "Testing Milk and Cream for Butterfat," Purdue U. Agric. Exp. Sta. Circ. 78.

Clean Glassware is necessary for accurate testing. As soon as the test is completed, the test bottles should be emptied into an earthen jar or other vessel which cannot be attacked by the acid. Most of the white sediment in the bottom of the test bottle may be removed by shaking the bottle while emptying it. All glassware should be thoroughly washed with hot water containing some washing powder, to remove every trace of fat, and finally rinsed with clean, hot water. Our Ozo Washing Powder is excellent for this and other use in the plant. Small specks on the inside of the bottle can best be removed with a fine brush. Take care not to spill any of the used or unused acid on the clothing.

MILK TESTING

The standard milk test bottle is graduated from 0 to 8.0 per cent., and the divisions between the numbers represent 0.1 per cent. The neck of the bottle should be not less than 2½ inches long and the capacity of the bulb (to the bottom of the neck) should be not less than 45 cubic centimeters. The standard milk pipette holds 17.6 cubic centimeters, which is marked on the upper neck.

To measure the milk into the test bottle, insert the small end of the pipette into the milk sample, which has just been properly stirred, and suck the milk up into the pipette, stopping when it reaches a point an inch or two above the 17.6 c. m. mark and before it reaches the mouth. Immediately place the forefinger over the upper end of the pipette to prevent its flowing out again. Then, by cautiously lifting the forefinger, allow the milk to lower slowly in the pipette until the surface of the milk is exactly even with the 17.6 c. m. mark. The finger must be dry and the pipette held perpendicularly, with the mark on a level with the eye. Then place the lower end of the pipette entirely in the neck of the bottle, as shown in the illustration. Remove the finger and allow the milk to flow into the test bottle, blowing out the last drop of milk into the test bottle. Mark or label the test bottle for identification.

How to add acid for the milk test. Use commercial sulphuric acid, with a specific gravity of 1.82 to 1.83. The drug house should be told that the acid is to be used for the Babcock test, that there may be no mistake about the specific gravity. Have the acid at room temperature, like the milk, or between 55 and 77 degrees F. Measure off 17.5 cubic centimeters of the acid in a graduated glass container and add this to the milk in the test bottle while holding the test bottle in an inclined position. If added properly, the acid will settle to the bottom of the bottle. Gently rotate the test bottle until the milk and acid are thoroughly mixed, all particles of curd dissolved, and then continue for a minute longer. Rotate it again just before placing it in the centrifugal tester.

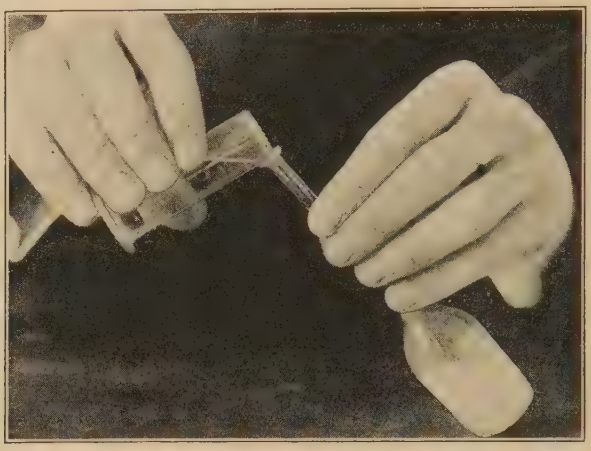
Warm the centrifuge either on a stove or by pouring boiling water into it which may be drawn off through a stoppered hole. Immediately

The Standard milk test bottle on the left. The other two are standard cream test bottles.

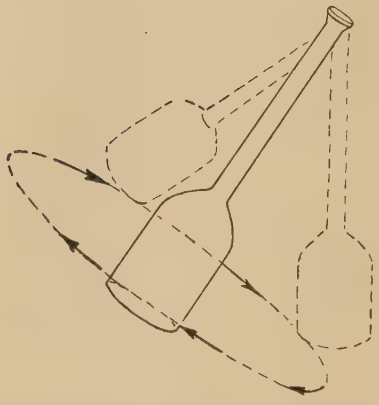
Proper method of putting milk into test bottle

after rotating the test bottles in the manner described, place them in the sockets of the centrifuge, with bottles in opposite sockets for correct balance. After covering the machine, whirl at the proper speed for a period of five minutes. Whirl 12-inch centrifuges at the rate of 1000 revolutions (about 80 turns of a handle) per minute, 18-inch centrifuges at the rate of 800 revolutions (about 64 turns of a handle) per minute.

After whirling for five minutes, stop the centrifuge and, with a pipette or small spout can, add hot water (between 140 and 200 degrees F.) to the samples in the bottles, until the contents come nearly to the bottom of the neck. Use soft (distilled or boiled) water for this. Whirl



How to hold the bottle in adding the acid.



Motion and position of test bottle while mixing the milk and acid[1]

again for two minutes to drive possible sediment out of the fat. Then stop the centrifuge a second time to add enough hot water to force the top of the fat column up to near the highest number in the graduated scale of the test bottle. Whirl one minute more and then remove the bottles from the centrifuge and place them in a hot water bath (135 to 140 degrees F.), the water on the outer side of the bottle neck reaching to the top of the fat column. In five minutes, take them out and read the percentage.

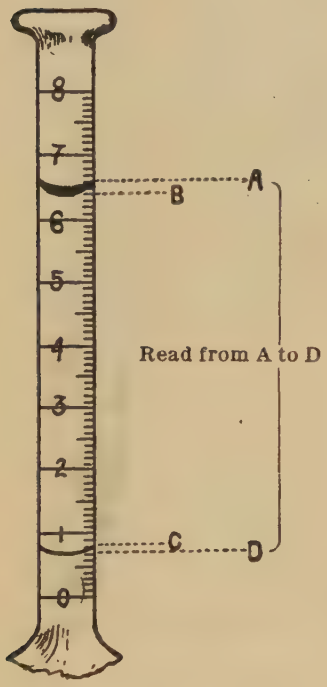
If the test has been successfully conducted, the fat column will be of a clear, yellowish color, with no foam on top, and will not contain charred or curdy particles.

A black, dark or charred fat column may be caused by using the acid too strong, too much of it, or at too high a temperature before mixing it with the milk.

A curdy fat column may be due to acid that is too weak, not enough of it, or at too low a temperature. In such a case, some of the butterfat may have been taken up by other milk constituents which were not properly dissolved.

[1]Cornell Ext. Bull. 116.

Bubbles at the top of the fat column are sometimes caused by the use of hard water. To avoid these, use soft or distilled water, or water to which a few drops of sulphuric acid have been added.



Include the entire meniscus or crescent at both ends of the fat column, in the milk test.

To read the percentage of butterfat in the milk sample, measure the height of the fat column, including the meniscus or crescent at both ends. The measuring is done with an ordinary pair of dividers. (See page 33). Place the sharp points at the upper and lower limits of the fat column to obtain the distance. Then lower the dividers until the lower point is at the 0 mark. The upper point will then be at the place on the scale which indicates the percentage of butterfat in the sample. In the adjoining illustration this would be 5.95 per cent.

CREAM TESTING

Standard cream test bottles (illustration, page 27) are of two types —50 per cent., 9 gram, short neck, and 50 per cent., 9 gram long neck. They are graduated from 0 to 50 per cent., with the smallest divisions representing 0.5 per cent. The capacity of the bulb, below the bottom of the neck, should be not less than 45 cubic centimeters.

Cream must be weighed into the bottle, not measured. A one-bottle scale, sensitive to 0.03 gram or less, is preferable. It should, at all times, be protected from corrosive substances, such as sulphuric acid, salt, etc. While in use the scale must be placed where it will be shielded from drafts, and on a firm, level base, so that the arm swings freely and truly.

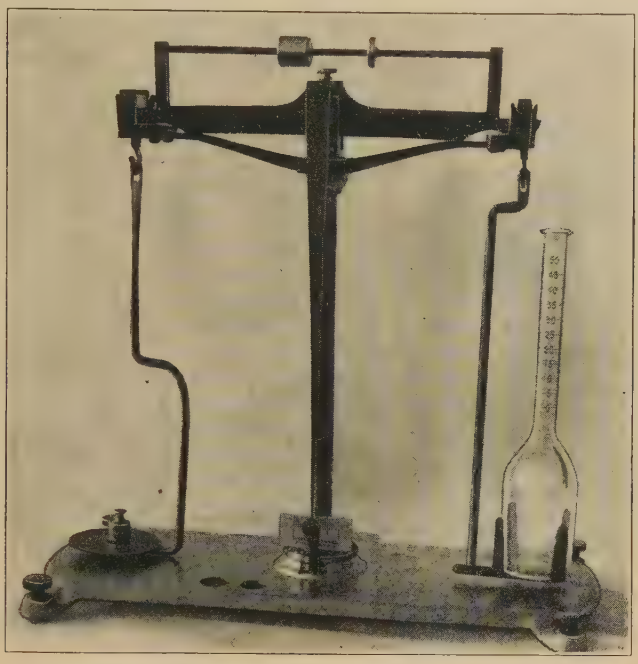
Cream test weights should be inspected for accuracy, from time to time, and should not be used if they are in error by 0.04 gram or more. A small quantity of foreign matter adhering to a weight when used, will cause an unreliable test. Exercise extreme care to keep the weights clean without reducing them by scouring.

One type of cream test balance, sensitive to 0.01 gram.

To sample cream, first mix it thoroughly by agitation, preferably by pouring it forth and back, from one container into another, until it is of uniform richness at all levels. Take from 2 to 4 ounces or about ¼ pint for a sample. Pour each sample into an individual, clean, dry, screw-top jar or into a wide-neck, glass-stopper bottle. Thick cream, old or lumpy cream, and cream that is partly dried on the container, may be improved for sampling by gradually warming it to about 95 degrees F. or until it has the proper consistency. Frozen cream should be gradually thawed in a warm room until all lumps have disappeared.

Balance the scale with the test bottle. Then weigh 9 grams of the thoroughly mixed cream sample, at room temperature, into the test bottle. Exercise great care to spill no cream on the outside of the bottle or on the scale. The accuracy of the test depends upon exact weighing.

How to add acid for the cream test. Use commercial sulphuric acid with a specific gravity of 1.82 to 1.83, at room temperature of between 55 and 70 degrees F. Add enough of it to give the mixture in the test bottle, after proper agitation, a coffee-brown color. The amount added will vary from 8 to 12 cubic centimeters, according to the richness of the cream, the strenth of the acid, and the temperature of the cream and the



Another type of cream test balance, sensitive to 0.1 gram.

acid. Hold the test bottle in an inclined position and gradually turn the bottle in the fingers while the acid is added, to rinse all adhering cream out of the neck of the bottle. Use a glass dipper which holds 8 cu. c.m. to add the acid. After the first dipperful, rotate the test bottle, in the manner shown on page 28, until the contents are thoroughly mixed. Then add more, little by little, until the coffee-brown color is attained, rotating the test bottle after each addition. A light color indicates that not enough acid has been added; a black color, that too much has been added. After the cream and acid have been completely mixed, no curd particles should be visible, and the mixture should appear uniform throughout.

Then place the test bottles in the sockets of the centrifuge, so distributing them that the disk will be equally balanced on all sides. Whirl the centrifuge and add soft water in the same manner as described for the milk test on page 28, observing the same temperature, speed, and periods of time. On removing the bottles from the centrifuge, place them in a water bath maintained at a temperature of 135 to 140 degrees F., the water reaching to the top of the fat column. Leave them there **for 10 minutes.**

A convenient method of adding acid to cream for the butterfat test.

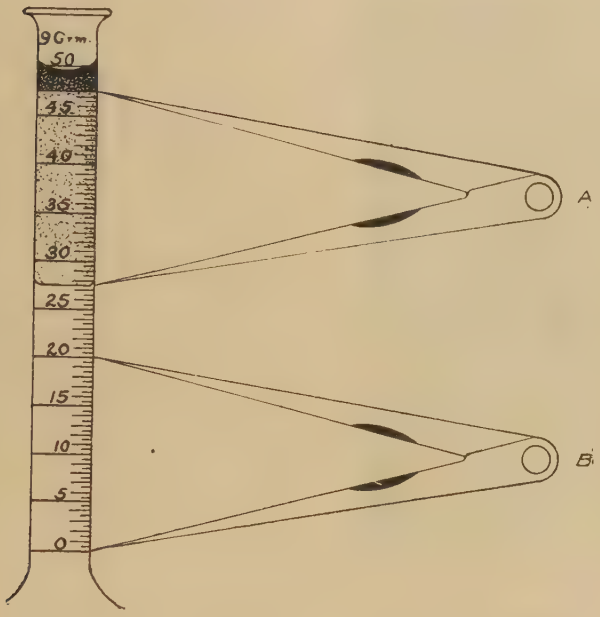
If the test has been properly conducted, the fat column will be of a clear yellowish color and the extremes of the fat column will be well defined. At the time of removing the test bottles from the water bath, add a few drops of colored glymol, letting it run down the inside of the neck of the test bottle to settle on the fat column to the depth of about ¼ inch. The glymol flattens the surface and so eliminates the meniscus or crescent, leaving a straight line at the top of the fat column.

To read the percentage of butterfat in the cream sample, measure with the sharp points of a pair of dividers. Place the points at the upper and lower limits of the fat column. Then lower the dividers until the lower point is at the 0 mark. The upper point will then be at the place on the scale which indicates the percentage of fat for the sample.

Glymol is a white mineral oil. For greater convenience in reading, it should be colored a deep cherry red. This may be done by suspending a small cloth sack of alkanet root in a jar of glymol until the desired color is attained. One ounce of alkanet root will color about a quart of glymol.

TESTING SKIM-MILK

The fat content of skim-milk is comparatively so low that the graduated scale on the neck of the test bottles for milk and cream would be too coarse for exact determinations. It is necessary to have a narrower



"A" measuring the fat column in the cream test; "B" moving the lower point of the dividers to 0. the upper point indicating the butterfat content (per cent.) in the cream sample.

neck, in order that the fat column may be thinned out over a length of neck equal to that of the whole-milk test bottle, while the scale ranges between 0 and 0.25 or 0.5, so graduated that the smallest division represents either 0.05 or 0.01 per cent. It would not be practicable to pour liquids, especially a dangerous acid, through so narrow a neck. For that reason, a second, much larger neck is provided through which the liquids are easily conveyed into the bulb.

The sample should be as carefully obtained and as carefully stirred or mixed as a whole-milk sample. The regular 17.6-cubic-centimeter milk pipette should be used for measuring the charge.

About 20 to 21 cubic centimeters of acid—commercial sulphuric acid with a specific gravity of 1.82 to 1.83—should be added to the skim-milk, instead of 17.5 cu. cm. Best results can be obtained if the acid is divided in portions and the bottle thoroughly rotated, in the manner shown on page 28, after each addition. Precaution should be observed that no material collects in the graduated neck when rotating the test bottle to mix the skim-milk and acid.

Two styles of skim-milk test bottles.

When ready to whirl, place the test bottles in the centrifuge or tester in such a position that the larger neck is turned to the center and the graduated, thin neck to the outer side of the centrifuge. This causes the fat to be forced into the calibrated neck when whirling and prevents the fat from collecting at the top of the bottle next to the larger neck.

For the skim-milk test, continue the first whirling of the centrifuge for 10 minutes, instead of the 5 minutes that whole milk is whirled, and keep the temperature as near to 140 degrees F. as possible. Then add water and whirl again as in testing whole milk.

BUYING CREAM

Commercial cream, as shipped and delivered for Ice-Cream making is usually between 30 and 40 per cent. fat; and often as much as 55 per cent. 36 per cent. cream, known as "double cream," is but little met with in Ice-Cream circles. However, many believe it the most convenient percentage at the Ice-Cream plant, because it is readily standardized to 18 per cent. by simply adding a can of skim-milk to a can of the 36 per cent. cream.

There are four methods of payment in vogue for cream: 1, the flat price rate; 2, the butter-market-plus rate; 3, the butter point rate; and 4 the cheese point rate.

Under the first method, cream of a fixed fat content is contracted for at an agreed price: for example, 36 per cent. cream was quoted in Chicago at $2.07 per gallon, flat, on January 17, 1927.

The second method fluctuates with the current price of 92 or 93-score creamery butter at a given market. An agreed amount is added to the butter price and the sum is multiplied by the number of pounds butter fat contained in the cream in question. Thus the quotation, "20 cents above Chicago butter market," fixes 36 per cent. cream at $1.86 per gallon when 92 or 93-score creamery butter is quoted in Chicago at 42 cents, wholesale. This is arrived at as follows: Add the agreed

amount (20 cents) to the current butter price (42 cents), and multiply the sum (62 cents) by the pounds of butter-fat per gallon in the cream (3 pounds in 36 per cent. cream): thus, 42+20×3=$1.86. As a rule, this is the most advantageous for the buyer when butter is low, say at 25 or 26 cents per pound.

The quantity of butter fat obtained from cream is roughly equal to 1 pound per gallon for each 12 points in the percentage of butter-fat. It may be calculated more or less exactly by multiplying the weight per gallon, as given on pages 38 and 39, by the percentage.

The third method, the "per point rate," determines the price by multiplying the butter-fat percentage by the agreed price per point: thus, the quotation "4½ cents per point" would fix the price of 36 per cent. cream at $1.62 per gallon (36×.045=$1.62) or that of 18 per cent. cream at $0.81 per gallon (18×.045=$0.81).

The fourth method of quoting cream is used in the vicinity of Cheese-making sections. This is based on the fluctuating price of the type of cheese that is standard in the locality. The price of the cheese, plus an agreed amount, is multiplied by an agreed factor, and the product is the price per pound of the butter-fat contained in the cream. For example, cream is quoted in a Wisconsin cheese market at "one cent over, on a 2.7 basis." The accepted standard in Wisconsin are new Single or Double Daisies[1], whichever are traded in chiefly. Therefore, when Double Daisies are quoted at 24 cents per pound, the above quotation would make 36 per cent. cream cost $2.02½ per gallon. This is explained as follows: Double Daisies being 24 cents, "one cent over" makes the multiplicand 25; the "2.7 basis" makes the multiplier 2.7. The product (.675), multiplied by the pounds of butter fat in a gallon of the cream offered, gives the quoted price per gallon: thus, 24+1× 2.7×3= $2.025.

Whatever the method, all figure out approximately the same at any given market. And yet the large buyer can often make a considerable saving if he is quick at mental calculation when a telephone offer is made for immediate acceptance, provided he keeps himself informed on the current quotations by all the methods in vogue. Butter-fat is the costliest portion of Ice-Cream, and it is important that it be bought right, as well as properly stored and used.

A suggested method of cream grading need not include more than two grades, either desirable or undesirable.

First grade cream should be clean in appearance and clean in taste and odor; it should be sweet, containing not more than 0.16 per cent. acidity calculated in lactic acid content; it should be smooth, entirely without undesirable taste or odor, test not less than the per cent. of butter fat which is lawful in the state in which it is to be used, and have a temperature between 33 and 50 degrees F. at the time of delivery. In case of shipment by express, considerations of economy should demand that it test not less than 30 per cent. butter fat.

Second grade cream should be such as falls, in any way whatever,

1. "Daisies" are flat, circular, American cheeses, weighing about 14 pounds each. The terms, "Single" and "Double" are merely the names of types.

below the standard fixed for the first grade. Such cream would be undesirable for making commercial Ice-Cream.

Objectionable flavors and odors most commonly met with are: barn, bitter, alkaline or soapy (from neutralizing), cheesy, lardy or tallowy, metallic, musty or stale, petroleum (from contact with kerosene, gasoline, machine oil), sour, vegetable, weedy, and yeasty. "Off" flavors and odors due to certain weeds and vegetables in the feed, are more pronounced in cream than in milk. They are sometimes more or less completely driven off by blowing clean air through the milk or pasteurizer. The air operates through the period of pasteurization with the temperature at 145 degrees F.

Collostrum is the first milk of a cow after delivering a calf. It is not fit for human food and must not be included in market milk or cream. Government regulations forbid the use of milk secreted during the fifteen days preceding calving and five days following it.

MILK SOLIDS NOT FAT

The proportion of solids not fat (technically known as serum solids) varies as strikingly between dairy breeds, strains, and individuals as does the fat content of milk. The table on page 23 shows that, in the whole milk as drawn, the serum solids content is generally higher in milk that is rich in fat, than it is in milk of low fat content. In skimmed and standardized milk and in cream the reverse is true: that is, the serum solids decrease as the proportion of milk fat increases.

The relative proportion of milk fat and serum solids is not in exact inverse ratio. An attempt is often made to establish the serum solids content by subtracting the known fat content from the whole milk or cream and multiplying the remainder (the serum) by 8.9 per cent., or 9.252 per cent., or some other arbitrary figure, to find the serum solids content.

For example, 30 per cent. milk fat subtracted from 100 leaves 70 per cent. serum; 8.9 per cent of this is 6.23. Accordingly, 30 per cent. cream should contain 6.23 per cent. serum solids and 36.23 per cent. total solids.

Stiritz and Overman[1], in a limited series of tests, undertake to show that the factor 8.9 is correct only at a fat content of 10, 41, and 60 per cent. and not at the intermediate percentages. According to their tests, 8.9 is too high a factor between 10 and 41 per cent. fat content, and too low between 41 and 60 per cent. and below 10 per cent. In fact, an error of nearly 3 per cent. is indicated, which may be enough to affect the quality of the Ice-Cream.

If that is true of 8.9 as a definite factor, it is equally true of 9.252 or of any other fixed numerals. It is our experience that a fixed percentage of the serum strikes the correct proportion of serum solids at only one fat standard, if at all. We also find the possibility of error to be far greater than those tests indicate. The 9.252 factor is arrived at by accepting the fat-free figures of 9.266 (see table, page 38,) less the proportion lost in separation.

1. Journal of Dairy Science, Vol. 111, No. 6.

Another method of determining the serum solids in milk or skim-milk, is by computing the total solids from the lactometer reading. Babcock, Richmond and others have devised various methods of doing this. Probably the best of these is the Richmond formula—

$$\left.\begin{array}{l}\text{Quevenne}\\ \text{lactomer}\\ \text{reading}\\ \hline 4\end{array}\right\} \quad (1.2 \times \text{fat content}) + 0.14 = \text{total solids}$$

For example the Quevenne lactometer reading for a milk testing 4 per cent. butterfat is 32⅓.

32.33÷4 =	8.0825	
4.00×1.2=	4.80	
Plus	0.14	
Gives the total solids	13.0225	
Less the known butter fat,	4.00	determined by test,
Gives the serum solids,	9.0225	or 9.02

Again, the Quevenne lactometer reading for a skim-milk which tests 0.05 per cent. butter fat is 36 1/3.

36.33÷4 =	9.0825	
0.05×1.2=	.06	
Plus	0.14	
Gives the total solids	9.2825	
Less the known butter fat,	0.05	determined by test,
Gives the serum solids,	9.2325	or 9.23

Every shipment of milk, cream, skim milk and milk concentrates received should be tested for total solids and for milk fat or butter fat, in order that the mix may be made accurately according to formula.

Hurried testing in creameries may easily cause an error of ½ per cent. in the stated fat content of cream or milk. As errors have a way of being always against us, this would amount to a loss of perhaps 18 cents. on an 8-gallon can, $1.80 on ten cans, and $9.00 on 50 cans the cost of a capable tester, if not indeed of a chemist.

If laboratory equipment is lacking, the following table must guide. It is the nearest practicable calculation of proportions which are never constant. It is not based on any formula, but on mathematical analysis of each milk-fat standard. It gives the specific gravity, weight, serum solids, and total solids for all standards of milk and cream up to 60 per cent. fat content. Up to 20 per cent. milk fat, the figures are based on an average of available authorities, modified by our own experience in all states; from 21 to 40 per cent., they are based on U. S. government figures[1] for specific gravity, also amplified by our own country-wide experience; and from 41 to 60 per cent., they are calculated from the skim milk and milk-fat content, with due allowance for the loss of serum solids in separation.

1. John T. Bowen, technoligist, U. S. Department of Agriculture, bulletin 98.

The table of "Solids in Milks and Creams" may safely be adopted for all theoretical and practical calculations. The structure of all other tables in this volume which involve milk or milk products is based on the figures in that table; the formulas on pages 124 to 192 are calculated accordingly; and the resulting products may be accepted as essentially correct.

SOLIDS IN MILKS AND CREAMS[1]

With Specific Gravity and Weight at 68 degrees F.

For Legal Standards of Dairy Products see page 396

Fat (Per Cent.)[2]	Milk Solids Not Fat (Per Cent.)[3]	Total Solids (Per Cent.)	Specific Gravity[4]	Weight Per Gallon (Pounds)[5]
0.0	9.266	9.266	1.0339	8.604
0.025	9.25	9.275	1.0338	8.603
0.05	9.236	9.286	1.0337	8.602
1	9.20	10.20	1.0328	8.595
2	9.14	11.14	1.0319	8.587
3	9.08	12.08	1.0308	8.578
3.20	9.068	12.268	1.0306	8.577
3.25	9.065	12.315	1.03055	8.5766
3.35	9.059	12.409	1.03045	8.5757
3.50	9.05	12.55	1.0303	8.574
3.69	9.04	12.73	1.0301	8.572
3.75	9.035	12.785	1.03005	8.5717
4	9.02	13.02	1.0298	8.570
5	8.96	13.96	1.0288	8.561
6	8.89	14.89	1.0277	8.552
7	8.83	15.83	1.0267	8.544
8	8.76	16.76	1.0257	8.535
9	8.70	17.70	1.0247	8.527
10	8.63	18.63	1.0236	8.518
11	8.57	19.57	1.0227	8.511
12	8.50	20.50	1.0216	8.501
13	8.43	21.43	1.0206	8.493
14	8.36	22.36	1.0194	8.483
15	8.29	23.29	1.0185	8.476
16	8.22	24.22	1.0175	8.467
17	8.15	25.15	1.0164	8.458
18	8.08	26.08	1.0153	8.449
19	8.01	27.01	1.0144	8.441
20	7.93	27.93	1.0133	8.432
21	7.86	28.86	1.0123	8.424

Fat (Per Cent)[2]	Milk Solids Not Fat (Per Cent.)[3]	Total Solids (Per Cent)	Specific Gravity[4]	Weight Per Gallon (Pounds)[5]
22	7.82	29.82	1.0114	8.416
23	7.75	30.75	1.0104	8.408
24	7.68	31.68	1.0094	8.400
25	7.62	32.68	1.0084	8.392
26	7.57	33.57	1.0075	8.384
27	7.53	34.53	1.0066	8.377
28	7.49	35.49	1.0057	8.369
29	7.45	36.45	1.0048	8.362
30	7.40	37.40	1.0039	8.354
31	7.36	38.36	1.0030	8.347
32	7.31	39.31	1.0021	8.339
33	7.26	40.26	1.0012	8.332
34	7.22	41.22	1.0003	8.324
35	7.17	42.17	.9994	8.317
36	7.13	43.13	.9985	8.309
37	7.09	44.09	.9976	8.302
38	7.04	45.04	.9967	8.294
39	6.99	45.99	.9958	8.287
40	6.94	46.94	.9949	8.279
41	6.88	47.88	.9939	8.271
42	6.83	48.83	.993	8.263
43	6.77	49.77	.9921	8.256
44	6.72	50.72	.9912	8.248
45	6.67	51.67	.9903	8.241
46	6.61	52.61	.9894	8.233
47	6.56	53.56	.9885	8.226
48	6.50	54.50	.9874	8.217
49	6.45	55.45	.9866	8.210
50	6.38	56.38	.9855	8.201
51	6.34	57.34	.9848	8.195
52	6.29	58.29	.9839	8.188
53	6.23	59.23	.983	8.180
54	6.18	60.18	.9821	8.173
55	6.13	61.13	.9812	8.165
56	6.08	62.08	.9804	8.159
57	6.02	63.02	.9794	8.150
58	5.97	63.97	.9786	8.144
59	5.91	64.91	.9776	8.135
60	5.86	65.86	.9768	8.129

[1]To be used only in theoretical calculations and in actual practice where laboratory equipment and technical operators are not available. While 3.69 per cent. butter fat has been adopted throughout this work as the average for the country, 3.7 per cent. is near enough for practical work.

[2]Skim milk separated at creameries averages 0.025 per cent. milk fat. Inefficient separation by dairymen raises the average of centrifugally skimmed milk of all the states to about 0.05. Whole milk varies principally according to the prevailing breed of dairy cows in a given dairy section: the average for the entire country is 3.69 per cent. milk fat. Twelve of the states have a milk standard requiring 3 per cent. butter fat; three of them require 3.20 per cent; fifteen, 3.25 per cent.; two, 3.35 per cent.; three, 3.50 per cent., and one, 3.70 per cent. The federal government does not specify.

[3]Technically known as "Serum solids": they include the proteins (casein and albumen), carbohydrate (natural milk sugar, chemically known as "lactose"), and the "ash" (salts and other mineral matter). From 0 to 20 per cent. milk fat, the serum solids are based on a comparison of available authorities, modified by experience in all states; from 21 to 40 per cent., they are calculated from specific gravities tabulated in an official bulletin of the U. S. Department of Agriculture, amplified by our own experience; and from 41 to 60 per cent., they are calculated from the skim-milk and milk-fat content, allowing 0.5 per cent. of all material for loss in centrifugal separation (as found by Farrington and Wall of the University of Wisconsin), of which 30 per cent. (0.15 per cent. of the whole) is calculated as serum solids.

[4]From 0 to 20 and from 41 to 60 per cent. milk-fat the gravities are calculated from the given fat, serum solids, and moisture content; from 21 to 40, they are official department figures (U. S. Dept. of Agr. Bul. 98, pg. 10), amplified by our own experience.

[5]Using Henry Droop Richmond's specific gravity figures of 0.93 (in terms of water at 68 degrees F. as unity) for milk fat; using both Fleischman's and Richmond's 1.616 for the specific gravity of serum solids: and using the U. S. Bureau of Standards' figures of 8.32162 lbs. as the weight of 1 gal. water, and 1.0028 as the volume of 1 gm. water at 68 F.

The present government standard for milk and skim milk stipulates no definite fat or other solids content, as may be seen in the following table:

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Skim milk		
Milk fat		0.05
Milk solids, not fat		9.236
Total milk solids		9.286
Whole milk		
Milk fat		3.69
Milk solids not fat		9.04
Total milk solids		12.73
Cream		
Milk fat	18	18
Milk solids not fat		8.08
Total milk solids		26.08
Acidity (not more than)	0.2	
Whipping Cream		
Milk fat	30	30
Milk solids not fat		7.40
Total milk solids		37.40
Double Cream		
Milk fat		36
Milk solids not fat		7.13
Total milk solids		43.13

CONDENSED MILK AND EVAPORATED MILK

To reduce the cost of transportation, storage, and handling, and to improve the keeping quality, both whole milk and skim milk are concentrated in vacuum pans by evaporating part of the natural moisture content. Owing to the vacuum the boiling point is lowered to between 130 and 135 degrees F. In this way it is sought to avoid the "cooked" taste of milk vaporized at higher temperatures. The process is more or less successful in removing foreign flavors from the milk—such, for instance, as the flavor of beets, silage, and other foodstuffs; but a cooked flavor of varying intensity may be acquired, which may affect the flavor of Ice-Cream in increasing degree as the proportion of condensed or evaporated milk exceeds about one-fifth the total mix. Furthermore, such flavors as may develop as a result of bacterial action, are apt to be more intense in condensed milk than in ordinary milk. The quality of the fresh milk and the degree of sanitation are the important factors in determining the quality of the condensed product. The condensing process should destroy 99 per cent. of the bacteria.

It is known as Condensed Milk when sold in bulk; that is, in barrels or milk cans. This may be "plain," skimmed, or sweetened. These are the forms commonly used in making commercial Ice-Cream.

It is known as Evaporated Milk when the vaporized whole, unsweetened product is sold in sealed cans. Though the process of vaporizing sterilizes, the sealed cans are again sterilized after canning, with steam under pressure, to kill the bacteria absorbed in the process of canning. Evaporated milk is intended principally for household, restaurant and hotel use, though it is used, to a limited extent, in commercial Ice-Cream. It is more apt to have a "cooked" flavor than condensed milk. Properly processed, it should keep as long as it is kept sealed and for a week or so after opening.

Condensed whole milk is usually reduced 2.15 or 2.2 to 1, but may vary more or less according to the efficiency of the condensing plant and its equipment and according to individual requirement. It is put up in ordinary milk cans and, when kept at a temperature below 40 degrees F., it remains in good condition during a period of 10 to 20 days, or even longer if produced and stored under perfectly sanitary conditions.

The composition of plain condensed milk or condensed whole milk is as follows, condensed 2.15 to 1.

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Milk fat	7.8	7.92
Milk solids not fat		19.42
Total milk solids	25.5	27.34
Sum of milk fat and total milk solids	33.7	35.26

Condensed skim-milk is ordinarily reduced 3 to 1, 4 to 1, or 5 to 1, but the 3 to 1 predominates because the natural milk sugar (lactose) tends to crystalize more perceptibly in the higher condensations. Condensed skim-milk lends itself readily to standardization with cream or butter, and it is therefore the most popular form of milk-solids-not-fat among Ice-Cream makers. It is usually shipped in 10-gallon cans. The keeping quality is somewhat lower than that of condensed whole milk, owing to the higher proportion of serum solids and consequent higher acidity, which, in turn, is due to the fact that skim-milk is usually older than whole milk before processing.

Condensed milk in which the lactose has crystallized, wholly or in part, must be restored to the original state before a quantity can be measured out of it for an Ice-Cream mix; otherwise, the part taken will not be constituted to fit the calculation of any formula. The crystals are best dissolved in a hot water bath: that is, the entire container is placed in water which has been heated to 160 degrees F. and the contents thoroughly agitated for 10 minutes or until all crystals are dissolved. If the mix is properly pasteurized, this heating is not necessary, providing all the crystals are gotten out of the can with the milk. Only entire container-fuls can be dumped into an Ice-Cream mix for pasteurizing, and then care must be exercised to get all the crystals with the fluid part. So treated, crystallized milk sugar does no harm, but unless it is so treated, it is more apt to re-crystallize within a shorter period of time, causing sandy Ice-Cream.

The composition of condensed skim-milk is as follows:

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Condensed 3 to 1		
Milk fat		0.14
Milk solids not fat		27.69
Total milk solids	20	27.83
Condensed 4 to 1		
Milk fat		0.185
Milk solids not fat		36.92
Total milk solids		37.105
Condensed 5 to 1		
Milk fat		0.23
Milk solids not fat		46.16
Total milk solids		46.39

Superheated condensed skim-milk is condensed in vacuum pans, like the other, after which it is heated to a temperature of 180 to 190 degrees F. and held at that until it swells (becomes thick) by precipitation of the albumin. Experiments at the Illinois Experiment Station[1] show that it increases viscosity, swell and resistance. The swell is more

[1]P. H. Tracy, Journal of Dairy Science, Vol. VI, No. 3.

easily obtained with superheated, especially if the mix is not homogenized. In our formulas, we recommend the use of superheated condensed skim-milk for all mixes whose total solids amount to less than 33.5 per cent., and unsuperheated where the total solids equal or exceed 33.5 per cent.

Sweetened condensed whole milk is practically plain condensed whole milk with 40 to 44 per cent. added cane sugar (sucrose) to preserve the milk. To prevent the growth of micro-organisms, the ratio of cane sugar to the combined sugar and moisture must not be less than 60 to 100: in fact (Rice and Downs[1]) have demonstrated that the protection is not entirely dependable with a lower ratio than 64.5 to 100, even when properly stored. The sugar content is apt to vary according to fluctuations in the price of the sweetened product. As long as the price of sweetened condensed milk is higher than that of granulated sugar, there will probably be ample sugar in the milk; but a test is warranted at any time if Ice-Cream is to be of uniform quality.

The Ice-Cream that contains a considerable proportion of sweetened condensed milk is apt to have a well defined "cooked flavor," which may be somewhat overcome by an increase of flavoring matter. If there is any crystallization or "sandiness" the lactose must be dissolved by heating and agitating at 160 degrees F., for a period of 10 minutes, or longer at a lower temperature, before attempting to use the condensed milk in the Ice-Cream mix. However, if the mix is to be pasteurized, this heating is not necessary; but it is essential that all crystals are in solution with the liquid milk. Properly manufactured, this kind of condensed milk will keep indefinitely if handled and stored in a sanitary manner at a temperature of about 45 degrees F. At 40 degrees or lower the lactose is apt to crystallize. It is usually sold in paraffined oak barrels of 600-pound capacity, in 8 to 10-gallon milk cans, or in hermetically sealed tins.

Either in bulk or in cans, sweetened condensed milk is apt to develop mold on the surface in the form of hard, cheesy, reddish-brown lumps of curd. Owing to their outline, they are known as "buttons." They measure ¼ to ¾ inch across and may be lifted off, leaving the rest of the milk unaffected. They indicate faulty sanitation and, according to the U. S. Dairy research laboratory[2], can be avoided by sealing the cans under a vacuum equal to a column of mercury of not less than 20 inches.

The composition of sweetened condensed whole milk, usually 2.4 to 1, is as follows:

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Milk fat	8	8.84
Milk solids not fat		21.68
Added sugar		42
Total milk solids	28	30.52
Total solid		72.52

[1]Frank E. Rice and Paul A. Downs, N. Y. State College of Agriculture.
[2]L. A. Rogers, A. O. Dahlberg, and Alice C. Evans, in Journal of Dairy Science, Volume III., No. 2.

Sweetened condensed skim-milk is practically condensed skim-milk with 42 to 47 per cent. added cane sugar. Beyond that, all that is said above of sweetened whole milk applies to the skimmed as well.

The composition of sweetened condensed skim-milk, usually 3.15 to 1, is as follows:

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Milk fat		0.145
Milk solids not fat		29.08
Added sugar		44
Total milk solids	24	29.225
Total solids		73.225

Examples of Ice-Cream formulas using condensed milk of one kind or another, are included under each standard, from 2.40 per cent. milk fat to 20 per cent., on pages 124 to 192. It may be well, as a general rule, to increase the flavor allowance by one-fourth when the quantity of condensed milk included is from 3 to 15 per cent. of the batch; by one-half when the quantity exceeds 15 per cent. This, of course, is entirely arbitrary. The quantity of flavor, in any event, is governed entirely by the demands of the community or the judgment of the mixer. In fact, the conception of correct flavoring is so variable, that it was thought best to make no recommendation in the formulas. If the condensed milk has no "cooked" or other objectionable flavor, the proportion of flavoring need not be increased even though there be over 15 per cent. condensed milk.

POWDERED MILK

Powdered milk is a convenient source of milk supply for the Ice-Cream maker, which renders him independent of the wide fluctuations in the need and supply of fresh milk. It saves transportation charges and refrigerator space, and saves the cost of keeping milk and cream cans sweet and clean. Without refrigeration, powdered milk may be shipped by fast freight, instead of by express, and can be kept for months, in a cool, dry place, without spoiling or becoming a medium for bacterial growth. It offers the necessary milk solids practically without also introducing bacteria with them.

Powdered milk is milk from which practically all the moisture has been removed, usually about 2.5 per cent. moisture remaining. It may be made of whole milk, skim-milk, and even of cream. The solids contained in milk, skim-milk, and cream, are partly in solution and partly in a state of emulsion. It would be impossible, therefore, to separate the solids by straining or filtration: this must be done by evaporation of the water or moisture. The evaporation of water must be done in

such a manner that it will leave the solids mixable (miscible) with water, so that milk, skim-milk or cream can be reconstituted by adding warm water. The powder must appear, on test, to be completely soluble, of light color, and free of burned particles.

There are five principal methods of producing powdered milk. The most familiar of these is that of spraying the liquid milk through tiny holes in metal disks into a current of heated dry air. The moisture in the milk is instantly absorbed by the heated air, and the remaining solid portion, separated into minute particles, falls like the finest, drifting snow, to the floor of the chamber in which the evaporation takes place. There is no superheating of the milk particles when they are blown into the current of hot air. Instead, the instant evaporation is claimed to have a cooling effect on the milk powder. When it has accumulated to a depth of several inches, it is ready for packing. By this method, no further pulverizing is required.

The second method of drying milk is by exposing it, either whole or condensed, in a thin layer, on the surface of a revolving cylinder that is heated by steam to as high as 248 degrees F., or by water at boiling point. The cylinder may or may not be inclosed in a vacuum chamber to reduce the temperature at which the drying is effected. The dried layer of milk is scraped from the cylinder automatically, without affecting the partial vacuum. The dried milk solids are then ground to a powder. The casein and albumin may be rendered more or less insoluble by this method.

A third method, in use to a very limited extent in Germany, is described by a correspondent of the Trade Press.[1] By this method the milk falls slowly "upon a swiftly revolving hollow ball through which warm air is passing." The moisture is carried upward by the hot air, as in the spray process. "The dried milk is swished off the revolving drum and collects in the form of a floss."

The fourth method of evaporating is by passing warm air through the milk from below to condense it and then evaporating the rest of the moisture content by exposing the condensed milk to heated air. The product is finally pulverized by grinding.

The fifth method is by simply boiling the milk in pans or other containers, with or without vacuum, until practically all moisture is evaporated. Here, too, the dry residue must be ground to a powder.

Milk powder may be obtained from whole milk, skim-milk or cream.

Powdered skim-milk is the form of milk powder most commonly used in Ice-Cream making. It has better keeping quality than milks containing fat. It affords a ready means of standardizing the milk solids, no matter if used with whole milk, cream or butter. With the use of a homogenizer, viscolizer, or emulsor, powdered skim-milk, unsalted butter, and water, can be made into a reconstituted milk or cream which is entirely acceptable for Ice-Cream, either in an emergency or as a standard product in sections that are remote from dairy districts. Such reconstituted milk or cream, even when ordinary water is used, is prac-

[1] G. H. Morison, correspondent, American Trade Press, (Dairy World, March 1924).

tically liquid milk with the same growth promoting[1] and anti-neuritic[2] properties as fresh milk, though the anti-scorbutic vitamins appear to be lost in one process[3]. Nevertheless, it is advisable to use water only where no form of liquid milk is available. The makers of homogenizers, viscolizers, and emulsors give full directons for their use with powdered milk, and the operation will be found exceedingly simple. If butter is not used, such machines can be dispensed with, though their action tends to improve any mix.

Even where milk and cream are always available, milk-solids-not-fat (serum solids) must often be added to give the mix sufficient body and quality. Powdered skim-milk is usually the most available for such use and, for that reason, we have used it freely in the formulas for all standards of Ice-Cream. For all standards up to 8 per cent. inclusive, the third last (antepenultimate) formula; from 9 to 15 per cent. inclusive, the last; and from 16 upward, the final two formulas under each standard—are made up with butter, skim-milk powder, and water. In addition to these, it is used with milk or cream under every standard.

It is not necessary to use water to dissolve skim-milk powder: the moisture of the mix will dissolve it as well. This is true also of Mello-Freeze and of gelatin. If water is used to dissolve the powder, due allowance must be made for it in calculating the mix: otherwise the entire formula will be upset, lowering the percentages of all solids and increasing the moisture content. If the mix is pasteurized, it is best to add the powdered milk when the mix reaches 90 degrees F. on the rising temperature.

Powdered milk should feel dry, loose, and fluffy. It will do so if it contains not over 3½ per cent. moisture. But the powder absorbs moisture readily and should be kept well covered and in the driest, cool room available when not in use. Even powdered whole milk, in the humid air which prevails in the average Ice-Cream factory, should keep a month to six weeks without deterioration, depending largely on the quality of the raw milk previous to drying. After that, it is apt to develop rancidity of the fats. When properly stored, so as to keep the moisture content below 3 per cent., bacterial action will be checked (inhibited) and it will keep much longer. Powdered skim-milk should keep indefinitely when kept dry.

Powdered milk should never be badly caked in the barrel, neither should it have a musty or bad odor or an "old" or bitter flavor. Milk that was overheated in drying is more or less insoluble. Old powder too may become less soluble, especially if allowed to absorb water from the atmosphere and therefore unfit for a good quality of Ice-Cream. Any part of the powdered milk which remains undissolved in the mix will give it a chalky flavor or a smeary texture. It is well, therefore, to test purchases by dissolving two level teaspoonfuls in one-fourth tumbler of water and examining the bottom for sediment after it stands an hour.

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[1]J. M. Johnson, Reprint No. 690, U. S. Public Health Reports.
[2]J. M. Johnson and C. W. Hooper, Reprint No. 689, U. S. Public Health Reports.
[3]E. B. Hart, H. Steenbock, and N. R. Ellis, Jour. Biol. Chem. 46, No. 2.

When the serum solids are furnished principally in the form of powdered milk, the product will generally have a perceptibly "cooked" flavor and a somewhat darker color than when those solids are furnished by fluid milk. Such "off" flavors can be improved, if not completely disguised, with a good quality and increased proportion of flavor. When using 1 to 5 pounds powdered milk in the 100-pound mix, it may be well to increase the usual allowance of flavor by one-fourth: when the proportion of powdered milk exceeds 5 per cent., the customary flavor allowance may be increased by one-half. Such increases are, of course, entirely arbitrary and the Ice-Cream maker must himself determine what is required to mask undesirable flavors. The matter of flavor must be governed by the demands of the community and the taste of the mixer. Our formulas do not attempt to prescribe either the grade or the proportion. An obstinate "cooked" flavor may be improved to some extent by a day or two in the hardening room.

Powdered whole milk is as useful as the skim-milk product; but, on account of the milk-fat content, its keeping quality is reduced. It should be kept covered in a darkened dry room, cooler than powdered skim-milk, and should be bought in smaller quantities at shorter intervals. If not kept cool in an air-tight container it may, in a relatively short time, develop tallowy, rancid, or fishy flavor.

Cream powder has been used in some localities where fresh cream is not available and where the lack of some kind of emulsifying equipment makes it impossible to use butter. Ice-Cream produced with cream powder is not as satisfactory as that obtained from regular mixes. It requires warm water to melt the butter-fat content, while powdered milk dissolves in water of room temperature, or lower. It is essential that it be kept cool, dry, dark and covered when not in use. Its keeping period before becoming rancid is relatively short.

The composition of powdered milk and cream is as follows:

	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Sample (Per Cent.)
Powdered skim milk		
Milk fat		1.35
Milk solids not fat		95.85
Total milk solids		97.2
Moisture (not more than)	5	2.8
Powdered whole milk		
Milk fat	26	28.2
Milk solids not fat		70.3
Total milk solids		98.5
Moisture (not more than)	5	1.5
Powdered cream		
Milk fat		71.15
Milk solids not fat		28.29
Total milk solids		99.44
Moisture		0.56

BUTTER, BUTTER FAT, AND THEIR SUBSTITUTES

The costliest part of the Ice-Cream mix is the milk fat, more commonly known as butter fat. Largely for that reason, the proportion of such fat is the standard by which Ice-Cream is rated. Whether the milk fat is used in the form of cream or butter is not very material; either, in correctly standardized proportion, and appropriately processed, can make an entirely satisfactory Ice-Cream, though sweet (fresh) cream is always preferred where available. Good will that is built upon sweet cream flavor should not be tampered with by changing to butter unnecessarily. With the arrival of abundant spring pastures there is an excess of cream. It would be wasteful of storage space to hold this excess until periods of scarcity in late summer and winter, even if cream could safely be held so long, which it cannot, except by freezing. It is customary, therefore, to churn the excess sweet cream into unsalted butter and store it, at zero temperature, for use in Ice-Cream when the price of cream may be prohibitive. It is found that unsalted butter, obtained from clean, sweet cream, has better keeping quality than salted butter.

Butter cannot be melted and incorporated with other ingredients by simple stirring or agitating. It will not reunite and form an even (homogeneous) emulsion with the liquids and solids not fat, except forcibly through a special machine known as a homogenizer, a viscolizer, an emulsor or emulsifier, or a blender. These machines combine milk, whole or skimmed, condensed or powdered, with or without water, with the melted butter in any desired proportion. To all intents and purposes, the result is a reconstituted milk or cream, as before churning, except that it is more viscous and, in the case of the homogenizer and viscolizer, cannot be churned back into butter.

Equipped with such a machine and provided with a sufficient supply of butter and powdered skim-milk, the Ice-Cream maker is independent of cream and milk contracts. He can adjust his supply to the vagaries of a sliding demand without waste or shortage, without worry or dissatisfaction. The sweet butter keeps in cold storage and the skim-milk powder keeps in any dry, cool place.

If only salted butter is available, it is cut in small chunks, melted in four to five parts clear water, at an even temperature between 115 and 140 degrees F., stirred 20 minutes, the water, salt, and serum solids then settled out in about two hours, and the resultant clear butter oil drawn off. This is calculated and used as pure butter fat, without moisture or curd content. The use of butter oil in dairy products is prohibited in several states.

Renovated or process butter is not suitable for Ice-Cream. Besides its more apparent inferiority, it has lost its growth-promoting vitamins by that operation and cannot be classed as a desirable food, least of all as a dairy product for children. Butter, cream, or milk that must be processed to mask rancidity or other form of decomposition has no legitimate place in Ice-Cream making.

Substitutes for milk fat in the Ice-Cream mix, whether homogenized or not, harmful or beneficial, are forbidden in most states and in inter-

state and foreign commerce. Ice-Cream is officially designated a dairy product, and any such substitution of the chief ingredient must be considered a deception, which merits no further discussion in the Guide for Ice-Cream Makers.

Butter used in the Ice-Cream mix should have a rating of 92 score or better, and should be unsalted, made of sweet cream and as fresh as circumstances permit.

This standard rating is based on the present definite regulations of the Federal Bureau of Agricultural Economics[1], which provide a perfect score of 100 points, itemized as follows:

Flavor	45 points
Body	25 points
Color	15 points
Salt	10 points
Package	5 points
Total	100 points

The judging of butter is a distinct profession which requires years of continuous, intelligent application to operate unerringly. Besides, the buyer rarely gets to see the butter before actual delivery. The average Ice-Cream maker would better watch market quotations and simply place his order with a responsible firm, perhaps in June, for "92 to 93 point butter, unsalted, scoring above 37 on flavor." It may be explained merely that unsalted butter is given the full rating of 10 points on the score for salt.

Examples of the use of butter with water and powdered milk, in Ice-Cream, are included among the formulas for all standards on pages 124 to 192. Up to and including 8 per cent., except 3.50 per cent., it is the third last formula; for 3.50 per cent. and from 9 to 15 per cent., it is the last formula: from 16 to 20 per cent., the last two. In addition to all these, there is an example of the use of butter in combination with some form of liquid or condensed milk under every standard from 2.40 to 20 per cent., except 3.50 per cent.

The composition of butter is as follows:

Unsalted Butter	United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Sample (Per Cent.)
Milk fat	80	83
Milk solids not fat		1.5
Total solids		84.5
Water	16	15.5

The present United States standard requirement for Milk fat or butter fat is that it have Reichert-Meisel number of not less than 25 and a specific gravity of not less than 0.905 at 40 degrees C. (104 F.)

[1]C. W. Fryhofer, Dept. of Agric. Circ. 236.

SUGAR AND SUGAR SUBSTITUTES

Sugar is a necessary part of the diet. It supplies energy, delays fatigue, and increases the capacity for muscular work, athletic exercise, and active play. It has an immediate stimulating effect because it is so easily and quickly made use of (assimilated) by the body. While starchy foods serve those ends, they lack the pleasing flavor of sugar and must be converted into sugar by the process of digestion before the body can make use of them.

Its functions in the Ice-Cream formula are primarily to stabilize and to sweeten, no matter if the product is considered as a food or as a confection. But 14 pounds per 100 of mix, or any other fixed quantity for all fat standards, is as absurd in the use of sugar as it would be in the use of any other ingredient. It is a fundamental principle that **all proportions in the Ice-Cream formula are relative.** It is equally ill advised to load the mix with all the sugar it will dissolve simply because sugar is the cheapest solid in the mix.

Sugar improves texture by reducing the amount of ice formed. This point can be established in water ices. Water ices which contain high percentages of sugar, with the same over-run, are smoother than ices which contain a low percentage of sugar.

An unduly high proportion of sugar makes it difficult to obtain proper swell, and lowers the freezing point, makes it difficult both to harden the frozen Ice-Cream and to keep it hard.

According to Reid[1], sugar lowers the freezing point of the Ice-Cream mix, delaying freezing and increasing over-run, and improves the flavor, body and texture with each additional increase of sugar up to 12 per cent. Thereafter the over-run was correspondingly depressed and the

[1]Wm. H. E. Reid, U. of Mo. Exp. Sta., Research Bull. 69.

flavor, body and texture, became inferior. The resistancy of the mixtures decreased as the sugar content was increased, the same being true when Ice-Creams containing sugar varying from 8 to 16 per cent. were exposed to a standard melting temperature of 86 degrees F.

Resistance to heat shown by different proportions of sugar in Ice-Cream at the end of four hours, at 86 degrees F. The bricks containing 14 and 16 per cent. sugar have a honeycomb appearance and the 16 per cent. brick is cracked.

Parfitt and Taylor[1] found that cane sugar (sucrose) lowered the freezing point of the Ice-Cream mix, the decrease taking the form of a regular curve, and the variation with each additional 1 per cent. of sucrose to the Ice-Cream mix caused a regular and constant lowering of the freezing point.

Effect of Sucrose on Freezing Point of the Standard Ice-Cream mix

Freezing point	Per cent. sucrose	Per cent. total solids	Per cent. serum solids	Per cent. fat
—2.0 c.	12.0	33.4	12.2	8.3
—2.4 c.	14.3	35.1	11.8	8.0
—2.7 c.	15.8	36.3	11.6	7.9
—3.0 c.	17.5	36.4	11.3	7.7
—3.6 c.	19.2	39.2	11.1	7.5

While the correct proportion of sugar is relished by practically all, excessive sweetness surfeits the appetite and diminishes consumption.

A lean mix requires a greater proportion of sugar than a mix that is thick with milk-fat, both because there is greater need of the solids as a stabilizer in the lean mix and because the distaste caused by an over-fatty mix is intensified if the sugar is not reduced in proportion to the excess of fat. This fact was established by our own exhaustive experiments, borne out by the experience of bakers and confectioners everywhere, and accepted in practice by discerning Ice-Cream makers, those whose national fame is based on the quality of their product.

Our experiments lead us to fix 14½ pounds granulated sugar in the 100-pound mix as the most generally pleasing in an Ice-Cream with 5 per cent. butter-fat or milk-fat, when the other ingredients are in the rational proportion of a good commercial product. By similar experiments, we established that 12 pounds granulated sugar impart the most generally preferred degree of sweetness to an otherwise correctly proportioned product with 20 per cent. butter-fat or milk-fat. Graduating these figures arithmetically from 14½ at 5 per cent. to 12 at 20 per cent.,

[1]E. H. Parfitt and C. L. Taylor, Journ. Dairy Science, Vol. 8, No. 3, pg. 232.

indicates a sugar requirement of 14 pounds (per 100), for 8 per cent. Ice-Cream, and 13 pounds (per 100) for 14 per cent. Ice-Cream. And this is also the finding of the foremost Ice-Cream makers.

Therefore, the regular graduation of the sugar requirement, in the third column of the Outline of Formulas, on page 17, cannot be considered as arbitrary. The efficient mixer will not leave it to chance or to individual taste. He may properly adopt the figures in that column as standard in the best commercial practice. Aside from the effect on the flavor, insufficient sugar throws too great a burden on other and costlier solids, while excessive sugar makes it difficult to obtain the proper swell, causing hard, soggy Ice-Cream, and makes it difficult both to harden the frozen mix and to keep it hard.

The better grades of Ice-Cream are commonly sweetened with cane sugar. But the term "cane sugar" does not necessarily mean that the sugar is obtained from sugar cane: cane sugar (or sucrose) is merely the chemical name of a sugar obtained from many sources. Beet sugar, cane sugar, and maple sugar, all are classed as cane sugar. Whether cane sugar is obtained from the sugar beet or from sugar cane has no bearing on the quality of the sugar or on the Ice-Cream made with it. Granulated cane sugar has the advantage that it sweetens sufficiently without unduly increasing the solids of the mix. It contains less than one-half of one per cent. moisture, being practically pure sugar. It is therefore well adapted to correct and convenient standardization and, under proper conditions of manufacture and storage, tends to increase the bacterial count less than other available sweetening agents.

The use of granulated sugar only, for the sweetening of high-class Ice-Cream, sometimes constitutes a waste that is by no means warranted by results. Science has placed at the disposal of the industry several sweetening agents which may, in an emergency or under exceptional conditions, be more economical to use than cane sugar, and which may be substituted for a portion of it without detriment.

These substitutes have a more or less definite relative sweetening power and their correct use, with the aid of the following table, is a mere matter of arithmetic. The moisture content of the sirups may vary considerably, but the degree of sweetness may be regarded as fixed at the figures given, subject to variation with the proportion of moisture.

Corn sirup, also known as starch sirup or glucose, is sometimes used as a substitute for cane sugar, and usually without proper regard for the effect on the solids. It tends to impart an undesirable flavor to the finished product.

Glucose is obtained by treating starch with water and a digestive acid. A good quality of corn sirup or glucose is, in truth, a predigested starch, as wholesome and clean as cane sugar. All sugars are, in effect, converted into glucose before they are utilized by the body cells.[1] The

[1]United States Dispensatory, XXI Edition.

National Academy of Science has officially declared that glucose is harmless even when taken in large quantities.

Comparative Sweetening Value of Granulated Sugar and Substitutes.[1]

	Usual Moisture Content of Commercial Product	Comparative Degree of Sweetness
Cane or beet sugar (granulated)	0.45	100
Invert sugar sirup	20	80.32
Maple sugar (medium hard)	7	93.37
Maple sugar (soft)	10	90.36
Maple sirup	32.5	67.77
Honey (44°B.)	21.5	75
Corn sugar	6.5	45
Refined corn sugar (colorless corn sugar)	0.4	55
Confectioners' corn sirup (43°B.)	17.3	20
Maltose sirup (42°B.)	20	30

A more reasonable objection to the corn sirup formerly used is the fact that it was made too "thick" (too dense). It required a jet of live steam to dislodge it from the barrel, a troublesome job at best which made it difficult to calculate accurately in a mathematically proportioned mix. This is now overcome by supplying it in any desired density, from 40 to 45 degrees Beaumé, as follows:

Density of Corn Sirup

Degrees Beaumé at 100 degrees F.	Total solids (per cent.)
40	76.4
41	78.5
42	80.5
43	82.7
44	83.9
45	85.5

The greatest density at which corn sirup or glucose flows readily, without the use of steam, is 43 degrees B,. and that is the strength adopted in our tables and formulas.

Corn sugar, as formerly produced, was never able to establish itself firmly in Ice-Cream circles. There is less need of it now that a more refined form is available.

Refined Corn sugar is a recent improvement of corn sugar. It is as white or colorless as granulated cane sugar and not as apt to cause bitterness of flavor as the ordinary or unrefined corn sugar. Normally, it tests 99.5 per cent. dextrose, 0.1 per cent. ash, and 0.4 per cent. moisture.

[1]Bureau of Chemistry, U. S. Department of Agriculture, July 30, 1921.

For every pound of granulated sugar replaced by corn products, it is necessary to use 5 pounds of corn sirup, or 2¼ pounds corn sugar, or over 1¾ pounds refined corn sugar, in order to produce the same degree of sweetness. A simple calculation will show, for instance, that **there can be no economy in substituting corn sirup for cane sugar when granulated sugar costs less than 12 cents per pound.** The same is true of the other corn products. The advantage, ordinarily, is in raising the total solids to a more workable level without affecting the degree of sweetness and without raising the milk-solids-not-fat above the limits of safety. This is illustrated in the tables on page 19. The Outline of Ice-Cream Formulas, on page 17, shows that those containing less than 8 per cent. of butter-fat do not normally contain enough solids for an all-enduring stability in commercial practice. The substitution tables, on page 19, show how those same standards can be raised to total solids of uniformly 33½ per cent. with either glucose or refined corn sugar.

Substituting corn sirup or refined corn sugar for half or more of the granulated cane sugar, or substituting ordinary corn sugar for more than one-third of it, may produce a disagreeable fatty, bitter, or sirupy flavor or a grayish or darker color. Corn products are soluble in both hot and cold mix and may be treated like cane sugar or cane sirup.

Honey is sometimes used for flavoring and it may even be an economy under exceptional conditions. However, it should not replace more than one-third to two-fifths the granulated sugar, as it produces a piercing sweetness that may be as objectionable as quantities of saccharine. The peculiar flavor cannot usually be masked with flavoring extract.

Maple sugar and maple sirup are too expensive to be considered as substitutes for granulated sugar in commercial Ice-Cream, except under extraordinary conditions. Neither maple sugar nor maple sirup is ever refined, as that process would take from it the distinctive flavor which gives it greater value and would leave a cane sugar similar to that obtained from beets and sugar cane.

The use of maple sugar or maple sirup in the Ice-Cream mix would make it necessary to recalculate the entire formula to suit the changed ratio of solids to moisture. Not more than 14 to 15 per cent. of the granulated sugar (2 per cent. of the entire mix) should ever be replaced with maple sugar or the flavor will suffer. It is far more economical, however, to stick to the formulas given in this volume, using granulated sugar and flavoring the mix with our Zanzibar-Brand Imitation Maple Flavor. Ice-Cream so flavored must, particularly if used in inter-state commerce, be labeled, "Artificially flavored".

Lactose, or natural milk sugar is a slightly sweetish form of crystallizable sugar that concerns the Ice-Cream maker only through the trouble it may cause and the losses it may occasion. If the formulas and directions in this volume are followed in every detail, the lactose should cause no trouble. A full discussion of this sugar will be found under the head of "Sandy Ice-Cream", on pages 228 to 234.

The composition of the various sweetening agents is as follows.

	Present United States Standard Requirement (Not Less Than) (Per Cent.)	Test of Average Market Samples (Per Cent.)
Granulated sugar		99.55 total solids
	99.5 sucrose	
		0.45 water
Invert sugar (sirup)		80 total solids
		20 water
Maple sugar (medium hard)		93.37 total solids
		6.63 water
(soft)		90.36 total solids
		9.64 moisture
Maple sirup		67.5 total solids
(not more than)	35 water	32.5 water
weight per gallon (not less than)	11 pounds	11.25 pounds
Honey		78.5 total solids
(not more than)	25 water	21.5 water
(not more than)	8 sucrose	
(not more than)	0.25 ash	
Corn sugar		93.5 total solids
	95 dextrose	
		6.5 water
(not more than)	0.8 ash	
Refined corn sugar		99.6 total solids
	95 dextrose	99.5 dextrose
		0.4 moisture
(not more than)	0.8 ash	0.1 ash
Confectioners' corn sirup (43°B.)		82.7 total solids
(not more than)	17.5 water	17.3 water
(not more than)	1.0488 ash	
Maltose sirup (42°B.)		80 total solids
		20 water

Invert sugar is a mixture of dextrose and levulose, which results from the inversion of sucrose. It tastes and acts like honey: in fact it is used as an adulterant of honey. It is also used in marshmallows and other candies which would otherwise dry out too readily.

It serves no purpose in Ice-Cream whatever, and those who adopted it in war time, under the mistaken impression that it saved sugar, have since discontinued it.

Commercal invert sugar available runs about 80 per cent. solids. Inversion increases the volume slightly, but the sweetening power of

invert sugar, instead of being equal to that of granulated sugar, is only 80.32 per cent. as much[1]. In other words, the gain by inverting 100 pounds granulated sugar is only one-third of one pound, which is not enough to repay the cost of inverting.

Furthermore, not more than two-fifths of the sugar can be replaced with invert sugar: otherwise the flavor will suffer. If it is to be used in conjunction with corn sirup, the combined sirups, in equal portions, cannot safely replace more than two-fifths of the sugar. However, there is no reason why it should replace any and a formula for inverting sugar would therefore be superfluous in a Guide for Ice-Cream Makers.

All sugars and sirups deteriorate more or less rapidly. Mold spores and other micro-organisms propagate in them even under the best conditions, but more rapidly in moist atmosphere. The molds consume the sugar, splitting it up into alcohol, acid, and carbon dioxide. Such sugar has a peculiar, sour, moldy odor and taste, and its sweetening power is diminished. "Sour" sugar should not be used in Ice-Cream.

No sugar, not even granulated, should be bought in larger quantities than can be properly kept in a cool, well ventilated storeroom or warehouse, as dry as possible. It should preferably be in barrels. Hogsheads are too unwieldy and wasteful of labor and material, while sacks are too subject to outer influences. The sugar should contain no visible dirt, and if the outside of sacks shows evidence of undue carelessness in this regard, an examination of the contents should certainly be made. Sugar in sacks should be stacked on racks which are raised at least 4 inches, and preferably from 6 to 12 inches, above the floor and protected on top with canvas or a layer of clean, dry sugar sacks. The chain stitch which closes the bag should be cut, at the extreme left, on the side which has the double twine or chain stitch. The twine can then be taken by the two ends and simply pulled out.

In calculating the comparative cost of a substitute for granulated sugar, it is important to include, not only the transportation charges of each, but also the value of storage space for the equivalent of a given quantity of granulated sugar. The relative cost of handling each, up to the completion of freezing, must be considered. Not only must the relative sweetening power be carefully computed, but the effect on the all-important flavor must not be ignored. Furthermore, the relative proportion of all other ingredients under the formula must be adjusted to any change in the sweetener specified: otherwise the percentages of milk solids or of any other item will not be correct as there given.

In the modern Ice-Cream plant quality and uniformity are usually of first importance. When those are satisfactory, the matter of selling price, can, as a rule, be adjusted to the costs. The consumer is generally more concerned about the product than the price. On the other hand, granulated sugar does not alone determine quality: the formula as a whole and the class of trade must be such as to warrant the best.

[1]Bureau of Chemistry, U. S. Dept. of Agric., July 30, 1921.

It is the tendency, in a liquid, for the heavier ingredients to sink toward the bottom, while the lighter ingredients rise toward the top. This tendency of gravity remains in Ice-Cream that is not completely hardened. Thus fat tends to rise to the surface, while sugar and other ingredients tend to find a lower level.

Both commercial and domestic Ice-Cream must have sufficient body and texture to maintain the consistency acquired in the operations of freezing and hardening. Early Ice-Creams depended entirely on cream for these: upward of 20 per cent. milk-fat was used, without knowledge of the proportion, purpose, and action of other solids. A proper balance of the constituents of Ice-Creams was not understood. Excessive milk-fat necessitated the prohibitive wholesale price of $1.00 and upward per quart, and that too when the dollar had several times the purchasing power it has today. And yet that costly product, actually frozen in one-quart freezers for commercial purposes, had to be entirely consumed immediately after hardening: otherwise the fat tended to separate and rise toward the top while the heavier solids and moisture sank to crystallize on the bottom. Even in the early eighties, the freezing process alone was depended upon to congeal the moisture of the mix and so fix the diffusion of ingredients. The Ice-Cream lacked the ability to "hold-up" till sold. It was coarse and lacked smoothness.

Various items, such as eggs, starch, wheat flour, and rice flour, were tried in an effort to reduce cost and stabilize the product. They survive to this day in certain formulas which are, in reality, mere cooked

and frozen custards. Such a product sticks to the roof of the mouth and has an objectionable starch flavor or the taste of powdered yolk of eggs.

Ice-Cream was then officially defined as a dairy product. The manufacturers' efforts to make lawful commercial Ice-Cream at a reasonable price and the retailers' demand for greater stability, resulted in a greater proportion of milk-solids, not fat (serum solids). This rendered Ice-Cream more edible for those who are not partial to fat and to the pastry cook's starch mixture; but the unbalanced product was subject to various crystallizations and granulations until the proper proportions of fat, serum solids, and sugar were arrived at.

The true stabilizers hold the ingredients of the mix in perfect diffusion throughout. They have the property of jelling the liquid, making it difficult to precipitate the solids. This strengthens the walls of air cells, stabilizes the body and tends to prevent shrinkage as well as a soggy, undesirable product. A comparatively minute quantity serves to bind the ingredients into a homogeneous whole. Typical stabilizers are Meloine and Mello-Freeze, gelatin, and "Snow".

When the jelling strength of the stabilizer is inferior, as in a low-testing gelatin, the proportion needed to stabilize the mix may be greater than official regulation permits. When a gelatin that is not sufficiently purified introduces into the mix micro-organisms which liquefy the jell before the Ice-Cream is used, the product collapses or shrinks.

In either case it is an error to try to overcome the difficulty by filling the mix with egg yolk, which is lighter than milk and cream, or with an excess of sugar, which is heavier. They do not act as stabilizers. Since Federal and state standards have defined Ice-Cream as a dairy product, it has steadily become better balanced and grown in favor. Science has determined that the perfectly balanced food elements of milk must be approximated if Ice-Cream is to be eaten in large quantities. It seems a backward step, therefore, to revert to the indigestible frozen custards and puddings of our grandmothers, when the magnificent industry of the present day was built up on a purely dairy product.

The excess egg production in China presents a problem in the economics of Asia. There is little rail transportation and refrigeration is rare. Eggs are apt to be transported from the interior to the seaboard in slowly crawling river boats or swung from the shoulders of coolies who may trudge for days in a blistering sun. Some eggs are deliberately "aged" for 30 days to acquire a characteristic Chinese flavor while wrapped in an alkali preservative. Other eggs go to a reduction plant where they are transformed by coolies, "under American supervision", into dehydrated egg yolk and egg albumen, for the American market.

Whether frankly sold under its own name or as the pretended prod-

uct of sea gulls, tests at the University of Illinois[1] show that dried egg yolk has neither stabilizing nor ripening properties and it has been known to impart a disagreeable flavor when used in sufficient quantity to improve body and texture. But eggs are unnecessary in correctly proportioned Ice-Cream, except in the case of French, Neapolitan, and Viennese Ice-Creams: and, even for those, a good color is the chief reliance in a desirable product.

The advent of food gelatin, Meloine, "Snow," and more recently Mello-Freeze, provided hydrophylic colloids to absorb the moisture instead of filling it with solids. They marked the scientific improvement of Ice-Cream, Sherbets, and Ices to a degree of excellence they had not theretofore attained. They made the frozen products available for commercial distribution by truck and by rail, permitting wholesale manufacture on an efficient basis. Finally Meloine and Mello-Freeze have helped to place within the reach of all a superb dish beside which the historical, obviously soggy Cream-Ice of Charles I would seem unfit to eat.

With the use of either Meloine or Mello-Freeze and a correct stabilizer, an Ice-Cream of more than 10 or 12 per cent. milk-fat becomes unnecessary, except where a fatter mix is required by law. They make a 14 per cent. product seem like 16 to 18 per cent., without, in fact, changing the fat content and without having the heating effect of excessive fat.

A good stabilizer and a scientific Improver are useful and necessary constituents of good Ice-Cream.

The following are classed as adulterants under the present federal standard of Ice-Cream:

Any filthy or decomposed or contaminated or poisonous substance which may render the Ice-Cream injurious to health.

Any rancid or renovated or process butter and any animal or vegetable fat or oil other than milk fat and the fat contained in nuts and flavoring emulsions and in clean, fresh, wholesome eggs when eggs are used as ingredients.

The table showing the correct proportion of all the non-milk colloids needed, in Ice-Cream of all standards, follows. It is scientifically correct by calculation and corresponds to the best commercial practice. **Here, as in the case of all other ingredients, the proportions are relative,** depending on the proportion of other solids. Meloine and Mello-Freeze alone are used in fixed proportion, the same for all fat standards. Nevertheless, statutory limitations have been duly considered and those affected by them must abide by such limitations.

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[1]Address of Prof. P. H. Tracy, Dairy Husb., Convention Illinois I. C. Mfrs. Assn.

CORRECT PROPORTION OF NON-MILK COLLOIDS[1]

in Ice-Cream and Ice-Milk, when compounded in accordance with the table on page 17, and in accordance with the formulas in this volume.

For formulas containing milk or butter-fat percentage of	GELATIN [2]			MELOINE OR MELLO-FREEZE used dry [3]			"SNOW"			Total Colloids[4]
	In the 100 lbs mix (pounds)	In the 5-gallon mix (ounces)	In the 100-gallon mix	In the 100 lbs. mix (pounds)	In the 5-gallon mix (ounces)	In the 100-gal. lon mix	In the 100-lbs. mix (pounds)	In the 5-gallon mix (ounces)	In the 100-gallon mix (ounces)	In the 100 lbs. mix (pounds)
2.40	0.501	3¾	4 lbs. 9½ oz.	0.111	1	1 lb.	0.105	¾ oz.	15½ oz.	0.717
3.50	0.482	3½	4 lbs. 6¾ oz.	0.111	1	1 lb.	0.074	½ oz.	10¾ oz.	0.667
4	0.474	3½	4 lbs. 6 oz.	0.111	1	1 lb.	0.065	½ oz.	9½ oz.	0.650
5	0.458	3¼	4 lbs. 3 oz.	0.111	1	1 lb.	0.047	⅜ oz.	6¾ oz.	0.616
6	0.442	3¼	4 lbs. ½ oz.	0.111	1	1 lb.	0.034	¼ oz.	5 oz.	0.587
7	0.425	3	3 lbs. 13¾ oz.	0.111	1	1 lb.	0.017	⅛ oz	2½ oz.	0.553
8	0.409	3	3 lbs. 11½ oz.	0.111	1	1 lb.				0.520
9	0.391	2¾	3 lbs. 8½ oz.	0.111	1	1 lb.				0.502
10	0.375	2¾	3 lbs. 6¼ oz.	0.111	1	1 lb.				0.486
11	0.359	2½	3 lbs. 3¾ oz.	0.111	1	1 lb.				0.470
12	0.342	2½	3 lbs. 1¼ oz.	0.111	1	1 lb.				0.453
13	0.326	2¼	2 lbs. 14¾ oz.	0.111	1	1 lb.				0.437
14	0.309	2	2 lbs. 12¼ oz.	0.111	1	1 lb.				0.420
15	0.293	2	2 lbs. 10 oz.	0.111	1	1 lb.				0.404
15.5 [5]	0.283	2	2 lbs. 8¾ oz.	0.111	1	1 lb.				0.394
16	0.277	2	2 lbs. 7½ oz.	0.111	1	1 lb.				0.388
17	0.260	2	2 lbs. 5 oz.	0.111	1	1 lb.				0.371
18	0.244	1¾	2 lbs. 2½ oz.	0.111	1	1 lb.				0.355
19	0.227	1½	2 lbs. ¼ oz.	0.111	1	1 lb.				0.338
20	0.211	1½	1 lb. 13¾ oz.	0.111	1	1 lb.				0.322

[1]Giving the actual weight of the entire ingredients: the table on page 17 shows solids content only.

[2]These quantities assume a high-test gelatin and average summer weather in a moderate climate. In colder climates or in winter weather either a slightly lower test or a slightly lower proportion of gelatin may be used.

[3]The table assumes that the mix will be stored 14 to 16 hours. If to be stored 24 hours or longer, the quantity of Meloine must be cut one-half. See "Ripening Time with Meloine," page 72.

[4]In Ice-Creams ranging from 7 per cent. milk fat upward, the actual colloids included in the totals are well within the 0.5 per cent. limitation of some states, though the total including moisture may seem to exceed that limit. If it is desired to keep the total non-milk colloids within 0.5 per cent. for all standards, then the proportion given for 7 per cent. Ice-Cream (0.554 per cent.) should be adopted also for the standards of 2.40 to 6 per cent. A stronger grade of gelatin will then compensate for the cut. Where the legal proportion is less, the Ice-Cream maker must be governed accordingly, adopting the total in the above table which is locally permitted and making up any cut by the use of stronger gelatin. The Meloine must remain unchanged.

[5]For use in holding down solids of higher-fat Ice-Creams, as shown in table on page 20. Solids in gelatin, 0.247; in Meloine and Mello-Freeze 0.106; total solids in non-milk colloids, 0.353.

GELATIN

Gelatin serves to absorb the water or moisture in the Ice-Cream mix by congealing it into a stiffer consistency. If this were not done, the moisture would soon freeze out in the form of icy crystals, no matter how much cream is used. The best grade of gelatin does this without perceptibly altering the flavor and color, without imparting an odor, and without introducing gas-forming, liquefying, or other objectionable micro-organisms. Incidentally, all the colloids (including Meloine or Mello-Freeze) have a possible tendency to prevent the crystallization of milk sugar (lactose).[1]

The statutory limitation and prohibition of gelatin in some states date back to a time when its production was in its infancy and its refinement and purification were not so thoroughly understood. The class of food gelatin which demanded limitation for hygienic reasons, is practically nonexistent today.

Gelatin is obtained by cooking bones, skins, tendons, and connective tissues of cattle, sheep and hogs. For use in so delicate a product as Ice-Cream, it has necessarily gone through an elaborate and highly sanitary process of purification and air drying, occupying a period of a month to six weeks. It is pure and wholesome as a food and, according to Dr. Downey, of the Mellon Institute of Industrial Research, increases the food value of foods with which it is combined.

It may be in the form of powder, granules, flakes, shreds, or in sheets, but the tendency is to the powdered or granulated form. These finer forms are more suitable because they are more convenient in handling; because they dissolve properly in 15 to 20 minutes while the coarser forms require 4 to 8 hours' soaking; and because they weigh heavier and require less storage space than flakes or sheets. On the other hand, the flakes and sheets show physical impurities more readily.

Low quality gelatin solution takes longer to congeal and it takes a larger quantity to congeal a given measure of Ice-Cream mix. It may add colonies of molds and bacteria which affect the quality or which soon multiply to such vast numbers as to consume and decompose the body of the gelatin, causing it to liquefy and lose its congealing and stabilizing property. The Ice-Cream then begins to collapse or shrink, perhaps even when held at hardening room temperature. The small quantity of Meloine or of Mello-Freeze used with it, tends to prevent this by shortening the ripening period.

Not all gelatin is of equal strength. The Ice-Cream maker must bear this in mind both in buying and in using. A formula which provides a high percentage of total solids can use a somewhat weaker gelatin or a smaller quantity of strong gelatin than a formula low in

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[1]A. C. Dahlberg (Geneva, N. Y. Exp. Sta. Tech. Bull. 111) states that gelatin "owes its chief value in Ice-Cream to its ability to form a jell in the Ice-Cream after it was drawn from the freezer. The protective colloid action of the gelatin in inhibiting ice crystal growth was no greater than the action of casein."

solids would need. A study of the Outline of Formulas, on page 17, will make this clear. It is a good practice however, to use a high-testing gelatin in all climates and at all times.

It must not be assumed that a mix that is short (deficient) in solids can be rendered as good as any by simply adding gelatin enough to make body. Such a course would be apt to result only in preventing proper aeration or swell of the mix, making a hard or a sticky or slimy Ice-Cream, and ruining the flavor. The proportions of gelatin given in the formulas in this volume should not carelessly be altered or ignored.

Weakness in the gelatin, can, to a limited extent, be made up (compensated) by increasing the proportion used. It is better, however, to have the correct proportion of solids and then **use a high-grade gelatin.**

Excessive proportions of gelatin cause a slimy, sticky, mix, reduce the yield or swell, render the Ice-Cream hard and unmelting on the tongue, and affect the flavor.

Insufficient gelatin causes separation and settling of the non-fat solids, icy and other forms of crystallization, and collapse of the swell. While Meloine and Mello-Freeze do their part in preventing such irregularities, care should be taken to see that the proper amount of gelatin is used. Comply with the formulas even to the smallest detail, and so save trouble and expense.

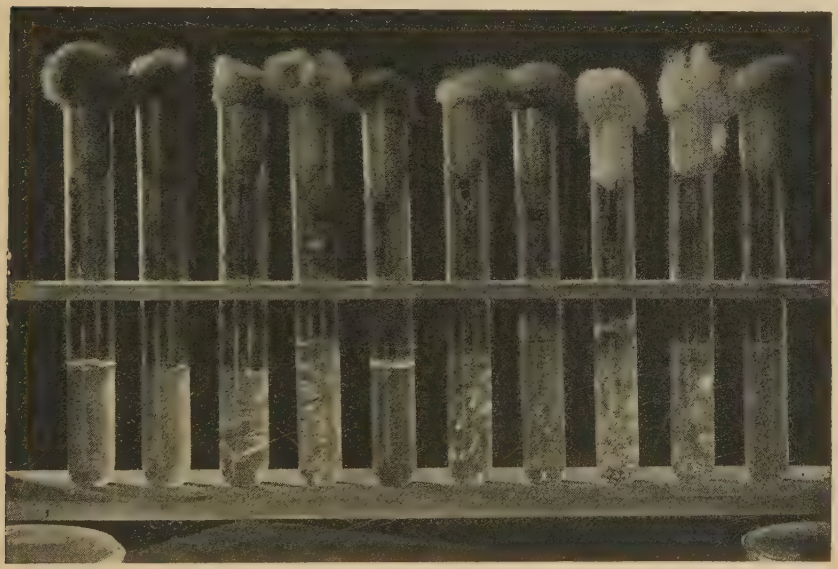
The proportion of gelatin to be used is shown in the table on page 60. These are the quantities used in the formulas in this volume: they are scientifically correct and are in accordance with the practical views of most manufacturers in the various sections of the country. Some states regulate the proportion of certain colloids (gelatin, Meloine, Mello-Freeze and "Snow". Since most of them specify 0.5 per cent. or more, all formulas, from 7 per cent. Butterfat upward (that is, the statutory Ice-Creams) may generally be used without charge.

High-Quality gelatin has a scarcely perceptible, inoffensive odor: low-quality gelatin has the odor of glue, when heated, is more acid than the pure, and may contain chemical and visible (physical) impurities. It would be false economy to use any but the best obtainable of pure-food gelatin. If only an inferior grade is available, it should not be so inferior that it will not jell (congeal) on test: such gelatin would have no colloidal value and might even be injurious.

Testing gelatin. A bacteriological test, using a chemist's ordinary test tubes, 6 inches long ¾ inch in diameter, is a simple matter for the average Ice-Cream maker and it should be undertaken before buying.

The test tubes cost only 33 cents per dozen or $3.30 per gross; but any clear drinking glasses can be used. They should be sterilized with steam or by boiling in water 20 minutes immediately before using in the test. Clean, clear water that has been boiled for 20 minutes should be cooled to about 160 degrees F. before beginning. In a sterilized meas-

uring glass calibrated to the ounce or less, measure off 6 1-8 ounces of the water and stir into this one level teaspoonful (which is one gram or 1-8 ounce) of the sample gelatin. The hot water will bring out objectionable odor. Agitate from time to time with a sterilized stirring rod or spoon till completely dissolved, about 5 minutes. Then pour enough of the solution into two sterile test tubes or other sterile containers to fill them about two-thirds full, plug the mouth or opening of each with a wad of sterile absorbent cotton, and set them aside to jell (congeal). Then treat all other samples exactly the same, sterilizing the spoon or rod and measuring glass before each lot, that a fair comparison may be made. It is well to have each in duplicate to guard against possible mishap and to check one against the other. Each tube must, of course, be labeled to correspond to the sample it represents.



Samples of gelatin undergoing bacteriological test and test for jelling strength in ordinary test tubes, plugged with sterile cotton. Note the formation of gas in part of the samples.

This test will show the length of time required to congeal; the clarity and odor of the product; the development of the liquefying, gas-producing and other organisms of inferior gelatins; and the length of time it remains firm before it is broken down or decomposed by liquefactive bacteria. It may reveal the fact that a clear, odorless gelatin is not necessarily desirable for other reasons. The best grades will congeal as soon as cool and remain firm and clear for many days; others may take up to 48 hours to congeal and almost immediately begin to liquefy again. The worst may not congeal at all, and it is safer to assume that the 2 per cent. solution that will not congeal at room temperature will prove worthless in a 0.375 per cent. solution, even in the low temperature of

the hardening room. The value of the test is in the determination of the comparative merit of several samples at ordinary room temperature.

To test for jell strength. The reason for the use of gelatin in Ice-Cream is that, when the Ice-Cream is frozen, the water not combined will be in a colloidal state, due to the action of the gelatin. It is of prime importance that the Ice-Cream maker buy a gelatin of sufficiently high jelling power to produce this desired condition in the finished product. When using 0.5 per cent. or less of gelatin in the mix, a gelatin should be used that will sufficiently increase the colloidal strength of the mix at hardening room temperature in a solution of that strength. This can be tested satisfactorily in the following manner. Measure 12½ oz. of water into a mason jar and bring to a temperature of 160 degrees F. Add 1 level teaspoonful of the gelatin to be tested. This gives a gelatin concentration of 1 per cent. Stir to dissolve the gelatin and, upon dissolving, place lid on jar and allow to cool, preferably in water. Then place in the milk cooler or ice box and examine in 24 hours. If, on tilting the jar, it shows a jell, the gelatin is of sufficient strength. It is best to make the test in duplicate in order to guard against mishaps. If an ordinary refrigerator, ice box, milk cooler or mixture aging room is not available, the jar or jars containing gelatin solution can be packed in the same manner as Ice-Cream for shipment in tubs.

Neither microscope nor other bacteriological or physical equipment is necessary for such tests. The interesting anaerobic and other colonies will be easily seen with the naked eye.

Laboratory equipment for use with gelatin, such as depression testers, viscosity testers and polariscopes, is useful and worth all it costs to the large Ice-Cream producer.

Gelatin has excellent keeping quality, but it is important that it be kept in a cool, dry atmosphere: otherwise it decomposes rapidly.

Present U. S. Standard requirement. Gelatin for food purposes must be clean and without decomposition: it should contain no admixture of glue or other extraneous substance, and should not contain to exceed—

Arsenic oxide	1.4 parts per million	(0.0000014	per cent.)
Copper	30 parts per million	(0.00003	per cent.)
Zinc	100 parts per million	(0.0001	per cent.)
Lead	20 parts per million	(0.00002	per cent.)
Sulphur dioxide	350 parts per million	(0.00035	per cent.)

How to Use Gelatin

Where the mix is pasteurized or homogenized, the best method is to sift the gelatin over the completed cold mix, stir it in well for five minutes, and then proceed to pasteurize in the accustomed way. In flash pasteurization, however, the gelatin must be dissolved in the same manner as where the mix is not pasteurized: then add the solution when the two are of the same temperature, before homogenizing and cooling. Adding a hot gelatin solution to a cold mix tends to congeal the gelatin, making it more or less stringy and difficult to diffuse evenly.

It is best to pasteurize and homogenize the gelatin with the mix, at 145-degree held pasteurization, running it directly from the pasteurizer through the homogenizer without further preheating and from there directly over the cooling pipes. This insures a better, more uniform product. The frozen Ice-Cream "stands up" better because of the more complete absorption of moisture, preventing particles of undissolved gelatin and insuring even and complete distribution. If it is considered desirable to melt the gelatin separately, proceed as where the mix is not pasteurized.

If the mix is not to be pasteurized or homogenized, it is best to make a hot gelatin solution and to add that to the mix. Gelatin dissolves completely in about nine or ten parts water to one part gelatin, making about a 10 per cent. solution. But the addition of that much water would destroy all the carefully calculated proportions of the formulas in this volume. It is necessary, therefore, to take the required quantity of liquid from such water, skim milk or whole milk as may be provided for in the formula used. Put this into a cold jacketed kettle or double boiler and soak the gelatin in it for a period of 5 minutes. Then turn on the steam or place the double boiler over fire until a temperature of 160 degrees F. is reached, stirring briskly. Then turn off the steam or remove the double boiler from the fire. Continue to stir until the gelatin is completely dissolved, about 5 minutes more. When it has cooled to about 100 degrees F., pour the solution slowly into the mix, stirring vigorously until thoroughly and evenly distributed. The Ice-Cream maker must be careful to strain the solution into the mix if it appears necessary. The mix is then ready for cooling to about 40 degrees F., whereupon either Meloine or Mello-Freeze and flavor are added. The gelatin kettle or boiler must be thoroughly cleansed in boiling water before each batch is "run."

If the milk used in making the solution curdles when so heated or when the gelatin is added, it is an indication that it has not been kept at low enough temperature to prevent the growth of lactic acid bacteria, and the dairyman and jobber must be instructed to remedy this in the manner suggested by the article on "Acidity." Even though the acidity of the milk be comparatively low, curdling may be caused by extreme acidity of the gelatin added: in that case, an effort should be made to obtain gelatin that is less acid.

Excessive heating, it is quite evident, injures the colloidal or stabilizing properties of gelatin by destroying the jelling power of some, more than of others. The greater and more prolonged the heat (about 165 degrees F.) to which gelatin is subjected, the more of it will be required to stabilize a batch. Turning live steam into it to soften it, injures gelatin to such an extent that fully double the quantity is required to obtain the same stabilizing results.

MELOINE

Meloine is a non-crystallizable preparation which improves the body and texture of Ice-Cream, making it smooth, velvety, and mellow. It shortens the time required for ripening the mix and restoring and increasing viscosity, thereby avoiding the ills and misfortunes of storage and reducing the requirement of cans, storage vats, cooler-space and refrigeration.

Freshly Made Ice-Cream Mix Has Been Described as "Loose and Sloppy." It lacks the viscosity necessary for an enduring swell in the freezer. Such little swell as could be obtained in that condition would collapse before it could be hardened. No matter how heavily charged with solids it may be, it must be ripened, either with the aid of Meloine or Mello-Freeze, or by storage for development of "liver," to yield a proper swell.

Pasteurization Makes It "Looser and Sloppier"—in fact, the more thorough the pasteurization, the more completely is viscosity destroyed.

Proper homogenizing, if the mix is not sour, restores it, by reducing the size of the fat globules, to about the degree of viscosity it had before pasteurizing, but without improving the whipping properties and therefore just as unfit for immediate freezing. Pasteurizing hardens the proteins, while homogenizing and viscolizing break the fibre filaments of casein which, with the decrease in size of fat globules, are commonly accepted to be the main cause of viscosity. Meloine tends to soften and reunite them, making a proper swell possible without costly storage. Mechanical viscosity, due to homogenizing, viscolizing and emulsifying, is destroyed to some extent by the freezer. This is clearly shown by the formation of icy spines or crystals formed, under irregular temperatures, in Ice-Cream made of a homogenized mix. Forced ripening with Meloine is intended to prevent just such results. Viscosity due to proper ripening is not destroyed; on the contrary, it is an important factor in the production of an enduring swell.

To create viscosity by storage only, it is necessary to store the mix from two to three days. During that period the mix must be held at a temperature sufficiently low to retard the growth of bacteria which cause souring and the development of "off-flavors" and odors. This is preferably 36 to 38 degrees F. and should not exceed 40. A temperature of 33 to 34 degrees is better to retard the growth of bacteria; but temperatures are apt to fluctuate enough in any plant to cause a mix to freeze when held as low as 33-34. While so frozen, all ripening stops, causing uneven viscosity and making it impossible to obtain uniform swell with different batches.

As a matter of fact, ripening by storage is more often done above 40 degrees than below. At such higher temperatures, the growth of bacteria and consequent decomposition of milk solids go right on through the entire storage period. C. E. Marshall[1] has shown that bacteria will grow at temperatures below 50 degrees F., and the types of bacteria that grow at these temperatures are especially undesirable species in that they are capable of splitting proteins with the production of bitter and astringent flavors. **It is therefore essential for the ripening period to be as short as possible.**

Acidity does not cause viscosity: in fact, the greater the acidity of the mix, the less the viscosity.[2] The work of the lactic acid bacteria actually inhibits or retards biological ripening. High-grade Ice-Cream is then out of the question.

Meloine or Mello-Freeze prevents such deterioration by making storage ripening unnecessary, and improves the texture and smoothness of the product. Progressive Ice-Cream makers have learned that it does not pay to ripen by storage since ripening a mix to which Meloine or Mello-Freeze has been added, for a period of 2 to 16 hours gives better results and at a lower cost. They have modernized their methods.

Meloine and Mello-Freeze make Ice-Cream more wholesome because, by shortening the time needed for ripening, they avoid unnecessary increase in the number of bacteria, and the decomposition, fermentation, "off flavors," and odors, due to those organisms.

Neither Meloine nor Mello-Freeze is a substitute for gelatin; neither do they take the place of sugar or any other necessary ingredient. They have purposes of their own in the mix, purposes which are distinct and necessary to a salable, commercial product, and which the other ingredients do not fulfill—least of all, starch, dried egg yolk and similar items. Such things have but little stabilizing value, as they themselves tend to precipitate. They have no ripening properties whatever. As a matter of fact, correctly compounded Ice-Cream requires no such items of any kind. Any addition to the ingredients the formulas in this book call for,

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[1]Prof. C. E. Marshall, Ph.D., head of Dept. of Microbiol. dir. Grad. School, Mass. Agric. College.

[2]Prof. Walter W. Fisk, convention, N. Y. Ice-Cr. Mfrs. Assn. Buffalo, 1925.

would be wasteful and would disturb the mathematical balance established by careful calculation.

Meloine emphasizes fresh cream flavor and quality, making the costliest ingredient more apparent. As it improves the texture and smoothness of Ice-Cream, some may be tempted to reduce the percentage of butter fat below local standards. They should be warned that the actual fat content is not raised by the addition of Meloine, as the routine test will show. The improvement is due to its mellowing influence only, thereby producing a decided improvement in flavor, but that improvement does not permit the manufacturer to disregard the standard of milk fat or butter fat required in his state.

It is certainly poor business policy, however, to exceed the local fat requirement by two or three per cent., for better flavor and smoother texture, when the use of either Meloine or Mello-Freeze, at a cost of a fraction of a cent per gallon of finished Ice-Cream, accomplishes similar results. The proper use of Meloine as an aid to ripening lends to emulsified butter fat a more cream-like flavor and substance, and tends to neutralize both butter flavor and the flavor of condensed and powdered milk when these are not too pronounced.

Most of the undesirable flavors are either developed in long storage or intensified by it. Mildly forced ripening with the aid of Meloine reduces such losses.

Icy, grainy, and sandy crystals can be due only to faulty method or equipment when the ingredients are proportioned according to our formulas. However, the protective properties of Meloine tend to prevent crystallizations. This must not be construed as a premium on carelessness: nevertheless, it is gratifying to know that the right materials correctly proportioned can, with reasonably correct methods, be made into a uniformly excellent Ice-Cream, day in and day out.

Meloine and Mello-Freeze increase over-run. While they do not pretend to replace the dasher in the freezer, they aid in ripening a mix so quickly that a fresh, pasteurized mix will, in a few hours, yield about the same over-run as the mix without them would yield after two or three days' storage. This can be quickly proven. Divide a fresh, unstored mix equally, treat one-half of it with Meloine or Mello-Freeze according to directions, allowing it to stand for an hour or two until it thickens. The other part of the mix, containing no Meloine or Mello-Freeze, should also be held for the same length of time. Next freeze both parts separately, at the same time. It will be found that the half which has been treated with Meloine or with Mello-Freeze will show a greater yield, a smoother, mellower, and better flavor, and a better texture when hardened. To that extent Meloine increases swell.

The manufacturer who ripens by storage alone is continually encountering emergencies which make it necessary to use all that is stored, not only the 3- or 4-day old which may be fully ripened, but also the

48- and 24-hour stock which may be still more or less "loose and sloppy." If he uses an entirely fresh mix, he may get the bloom and aroma of new milk and cream, but he loses from 5 to 40 per cent. of the swell. The others may be in three or four stages of decomposition and sourness, they will all work differently in the freezer, and perhaps not one of them will be fit to stake a reputation on.

The manufacturer who ripens with the aid of Meloine is prepared for emergencies. Hot weather, picnics, festivals, circuses, shows, and holidays have no terrors for him. He can ripen the mix almost as fast as the ingredients can be carted into his plant. Every gallon and every brick will have the same swell and density; the same rich, mellow, smooth Ice-Cream from first to last; all obtained from uniformly and perfectly ripened mix.

The size of air cells determines the dishing quality of the product, large cells breaking down in dishing. They depend entirely on the degree of viscosity. It is to the credit of Meloine that it produces as small air cells with a few hours' ripening as costly storage produces in two or three days. But the dishing quality of the Meloine-ripened product will be greater than that of the storage-ripened. All things being equal, a greater number of dishes can be dished out of a packer can when Meloine or Mello-Freeze is used than from one in which neither is used. This is due to the tougher walls of the air cells with the use of Meloine.

Meloine must not be judged by the merits or demerits of its numerous imitations. Its successful preparation requires the knowledge and perfection of process and machinery developed by long years of costly experience. Meloine is the perfected product of more than 20 years' study and evolution. It is unlike any of the so-called improvers in composition, purpose and claims. They fail to understand that radical ripening necessarily produces a coarse product. The action of Meloine is mild and the result smooth and velvety. The man who buys a supposed imitation to obtain the results which Meloine is designed to produce, is not fair to himself or to Meloine. Its merit cannot be judged by trying something else. **Meloine reduces the cost of production and gives finish, class and distinction to the Ice-Cream.**

How to Use Meloine

Meloine solution can be made in a few minutes. It can be made anew for each batch, but greater accuracy and efficiency are promoted by preparing stock solution enough at one time for several batches or even for several days' run. It will keep for a week or ten days when held in the milk room or ice box.

Meloine is dissolved with sugar in cold water, in the proportion of 1 part Meloine to 2½ parts sugar and 16 parts water, no matter whether for small or large batches. The following table will aid in properly dissolving the Meloine for a batch of any size or for any number of batches.

PROPORTIONS FOR MELOINE SOLUTION

Size of Mix	Meloine[1]	Sugar	Cold Water	Total of Solution
For the 40-quart-freezer mix	1 ounce	2½ ounces	1 pint	1 pint
For the 60-quart-freezer mix	1½ ounces	3¾ ounces	1½ pints	1½ pints
For the 80-quart-freezer mix	2 ounces	5 ounces	1 quart	1 quart
For the 100-quart-freezer mix	2½ ounces	6¼ ounces	2½ pints	2¾ pints
For the 120-quart-freezer mix	3 ounces	7½ ounces	3 pints	3¼ pints
For the 50-gallon mix, use	½ pound	1¼ pounds	1 gallon	1 gal., ¾ pt.
For the 100-gallon mix, use	1 pound	2½ pounds	2 gallons	2 gals., 1½ pts.
For the 250-gallon mix, use	2½ pounds	6¼ pounds	5 gallons	5 gals., 3¾ pts.
For the 500-gallon mix, use	5 pounds	12½ pounds	10 gallons	10 gals., 7½ pts.
For the 750-gallon mix, use	7½ pounds	18¾ pounds	15 gallons	16 gals., 3¼ pts.
For the 1,000-gallon mix, use	10 pounds	25 pounds	20 gallons	21 gals., 7 pts.
For the 100-pound mix, use	0.111 lbs.	0.278 lbs.	1.844 lbs.	2.233 lbs.

The sugar and water used in making Meloine solution are taken in consideration in making up (compiling) the formulas in this Guide. This may be seen by referring to the percentage columns of the 100-pound mix in each formula. Therefore, the accuracy of the formulas is not altered by first dissolving the Meloine with sugar in water: in fact, the mix would not be correct, according to formula, unless the Meloine is first dissolved in the proportions of the above table and unless the solution is added to the mix in the proportions given in the formulas.

To prepare large batches of Meloine solution, we recommend the use of a clean Ice-Cream freezer for mixing it. This is managed as follows:

First pour the right quantity of sugar into the fruit funnel of the freezer; then add the Meloine while the machine is in operation. Next turn the proper quantity of cold water into the feed tank, opening the valve far enough to let a ½-inch stream into the freezer. When the feed tank is empty, allow the machine to run for a minute longer. Then stop the freezer and draw the solution into a can. A cake mixer or any other mixer may be used satisfactorily in preparing the solution.

To prepare small batches of Meloine solution, put the right quantity of sugar into a clean container. Add the Meloine and mix thoroughly, using a clean, large spoon or paddle. Then add sufficient cold water to make a stiff paste, working down all lumps. Gradually add the remainder of the water while stirring briskly with the spoon or paddle.

When all is dissolved, the solution may be used at once or it may be placed in the ice box or milk room as a stock solution and used as required. It should be kept as cool as circumstances permit: about 36 to 40 degrees F. is best. The mix must be agitated while the Meloine solution is slowly added.

[1]An Ice-Cream mix that has had its acidity reduced with a "neutralizer" requires half again as much (50 per cent. more) Meloine.

The time to add Meloine solution to the mix is when the mix has cooled. If it is not to be pasteurized or heated and the other ingredients are cold enough (as near 40 degrees F. as possible), the solution may be added at the time of mixing the batch. If the mix is pasteurized or homogenized, or both pasteurized and homogenized, it must go over the cooling device before the Meloine solution is stirred into it. It is then ready for ripening, which takes from ½ to 2¾ hours, at 44 degrees F., or from 5 to 12¾ hours at 40 degrees F., depending on the acidity of the mix, as shown in the table on page 72.

Over-night ripening is most satisfactory if the dairy products in it are fresh. The usual practice is to make the mix ready for ripening in the late afternoon or evening and to freeze it promptly the following morning, after ripening 14 to 16 hours. If it is necessary to hold it 24 hours or longer, the allowance of Meloine should be reduced by one-half.

Short-time ripening in an emergency may be found unavoidable at times in any plant. It is a satisfaction to the Ice-Cream maker, in such cases, to know that he has in Meloine an efficient aid in making his standard product almost "while you wait." The table on page 72 shows the remarkably short time in which Meloine does its work. It will be seen that the time depends on two factors: namely the acidity and the temperature of the mix. Of course, quality Ice-Cream can be produced only with fresh products of low acidity, ripened at a temperature between 38 and 40 degrees F., or not much higher.

While the table gives ripening temperatures of from 36 to 44 degrees, the mix should not go into the freezer lower than 38 nor much higher than 40 degrees.

A sour taste begins to be noticeable at 0.22 per cent. acidity, and the acidity should be kept below that point. A mix that approaches or perhaps even passes 0.22 per cent. acidity should be frozen as soon as it is fully ripened under the following table. Efficient plants manage to maintain about 0.18 per cent. acidity without the use of "neutralizers," which, after all, are truly preservatives. The shortest possible ripening time with the aid of Meloine, at an acidity of 0.18 is 12 hours, when held at 40 degrees F. Ice-Cream so made will have the bloom and aroma of fresh cream, rendered smoother and mellower by forced ripening, instead of the stale flavor of decomposition often brought about by storage ripening.

An Ice-Cream mix that has had its acidity reduced with a "neutralizer" requires "half again as much" Meloine as shown in the table on page 70; but the length of time for ripening is then the same as for fresh mix of equal acidity, according to table on page 72. Thus, for example, a partly neutralized mix which still tests 0.18 per cent. acidity needs 1½ ounces Meloine in the 40-quart-freezer mix or 1½ pounds Meloine in the 100-gallon mix. It would then take (according to the following table) 12 hours or more to ripen enough, at a temperature of 40 degrees F., for a full swell or yield.

RIPENING TIME WITH MELOINE OR WITH MELLO-FREEZE

Arranged according to Acidity of Mix at Different Temperatures.

For Mixes That Have Not Been Neutralized.

The maximum holding time without reducing the Meloine, is not quite 50 per cent. longer than the periods of time here tabulated. If the mix is to be held a full half longer than the table requires, then the quantity of Meloine must be reduced by one-half.

Acidity of mix (per cent.)	At 36 degrees F. (hours)	At 37 degrees F. (hours)	At 38 degrees F. (hours)	At 39 degrees F. (hours)	At 40 degrees F. (hours)	At 41 degrees F. (hours)	At 42 degrees F. (hours)	At 43 degrees F. (hours)	At 44 degrees F. (hours)
0.15	16	15½	15¼	13¾	12¾	10¼	7¾	5¼	2¾
0.16	15½	15¼	14¾	13½	12½	10	7¾	5	2½
0.17	15¼	14¾	14½	13¼	12¼	10	7½	5	2½
0.18	15	14½	14	13	12	9¾	7¼	4¾	2¼
0.19	14	13½	13¼	12¼	11¼	9¼	7	4¾	2¼
0.20	13	12¾	12½	11½	10¾	8¾	6¾	4½	2¼
0.21	12¼	12	11½	10¾	10	8¼	6½	4¼	2
0.22	11¼	11	10¾	10	9½	7¾	6¼	4¼	2
0.23	9¾	9½	9¼	8½	8	6½	5¼	3¼	1¾
0.24	8¼	8	7¾	7	6½	5¼	4	2¾	1
0.25	7	6½	6¼	5½	5	4	3	1¾	½

Those inclosed in the heavy lines above represent the lowest periods of time required for the complete ripening of a normal Ice-Cream mix. When any of these are held 24 hours or longer, the quantity of Meloine must be reduced by one-half. So, for example, a mix which tests 0.20 per cent. acidity must be held 10¾ hours or more at 40 degrees F. for complete ripening. It may be held over night or for a period of 16 hours without detriment. But if it is intended to hold it 24 hours or longer, the allowance of Meloine must be reduced to ½ ounce in the 5-gallon mix or ½ pound in the 100-gallon mix. It will then still produce a sufficient whipping ripeness in 24 hours, or any time after that, for a full swell or yield. The mix should not be held unnecessarily after the proper degree of whipping ripeness is reached. The bloom and flavor of the fresh mix should not be sacrificed. The viscosity obtained by homogenizing, viscolizing, or emulsifying is not the same as that obtained by ripening when Meloine is used. It will not whip in the freezer unless it is ripened, whether by long storage or by the use of Meloine or Mello-Freeze.

The figures outside the heavy lines, in the above table, represent those mixes which, on account of high acidity or high temperatures, should have only half the quantity of Meloine which is provided for in the table on page 70. Furthermore, when a batch of such a mix is to be held "half again as long" as the minimum time in the above table, then even that quantity of Meloine must again be reduced by half. Thus, for example, should a mix which has an acidity of 0.22 per cent.

be held at a temperature of 42 degrees F., the proper allowance of Meloine or of Mello-Freeze would be ½ ounce Meloine in the 5-gallon mix or ½ pound in the 100-gallon mix. It would then develop sufficient whipping ripeness for a full swell in 6¼ hours. In case it were not to be frozen within 9¼ hours, the allowance of Meloine would be only ¼ ounce in the 5-gallon mix or ¼ pound in the 100-gallon mix.

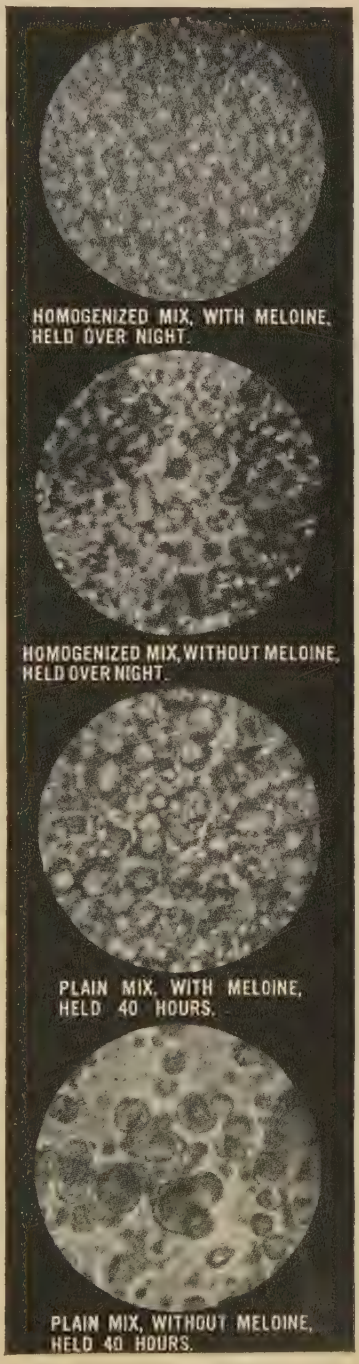
When the batch does not seem to act in accordance with the table on opposite page, it is due to a condition of abnormal milk products brought about by new feeds. So, the change from silage to spring pasture is very apt to retard the viscosity of the mix. However, such a mix will usually yield its proper swell, as a result of ripening with Meloine, though it may be "thin" and fluid. This proves that viscosity and ripening are not identical and that homogenizing does not make ripening unnecessary.

MELLO-FREEZE

Mello-Freeze is very similar to Meloine in action, except that it dissolves more quickly. The Ice-Cream maker pressed for time can take a little of the mix, stir in the necessary quantity of Mello-Freeze, and immediately add this to the mix for forced ripening. Like Meloine, it should be added at about 40 degrees F. when the mix is ready for ripening.

The proportion of Mello-Freeze to be used is identical with the proportion of Meloine, as shown in the table on page 70. The solution can be made in the same way to preserve accuracy; but the majority of the trade prefers simply stirring the correct proportion of Mello-Freeze alone into a little of the mix, adding this to the body of the mix, and letting everything else remain as called for in the formula.

The length of time required for ripening when Mello-Freeze is used is similar to that of Meloine, as tabulated on the opposite page.


HOMOGENIZED MIX, WITH MELOINE, HELD OVER NIGHT.
HOMOGENIZED MIX, WITHOUT MELOINE, HELD OVER NIGHT.
PLAIN MIX, WITH MELOINE, HELD 40 HOURS.
PLAIN MIX, WITHOUT MELOINE, HELD 40 HOURS.

Fruit Ices and Sherbets are simpler to make and more profitable than Ice-Cream. There is no intricate standardization; Ices use no milk, cream, butter, or other milk products whatever and Sherbets use them in very limited quantities: water usually constitutes the base of Ices. Both are cooling and refreshing and particularly satisfying in warm weather when the system does not crave the richer nutriment of Ice-Cream. In fact, many of those who are partial to Ice-Cream prefer it in brick form with a layer of simple Fruit Ice together with layers of vanilla and strawberry Ice-Cream. And they are entirely willing to pay Ice-Cream price for it.

Yet manufacturers who are not acquainted with the action of "Snow" often avoid Fruit and Water Ices because they have been unable to make them "stand up" like Ice-Cream. They have found that their Ices become rough and icy in texture very quickly and must be consumed as soon as made. Excessive meltage in transit leaves a slushy mass of color and flavor at the bottom of packer cans, and flavorless, icy crystals at the top. Unable to use gelatin and Meloine in them, the uninformed have considered ices unsuitable for market production.

"Snow" is to Ices and Sherbets what gelatin and Meloine are to Ice-Cream. It gives them a smoothness of texture which approaches that of the Ice-Creams of finer quality, and that smoothness endures to the last dipperful. "Snow" is a stabilizer which tends to prevent separation and tends to hold the sugar, flavor, and color in solution or emulsion to the very last, a firmer, uniformly delightful refreshment from top to bottom. Moreover, it enables Sherbets and Ices to resist meltage and shrinkage in transit and, therefore, opens broader markets for them; they can be shipped wherever Ice-Cream can be shipped.

"Snow" has stood the test of twenty-odd years and Fruit Ices and Sherbets have steadily gained in favor as a result. It is purely a vege-

table product, tasteless and colorless, which absorbs the water without itself becoming visible. It gives commercial value to a product which would otherwise be confined to the household kitchen.

"Snow" is extremely easy to use. It is in powder form, requires neither boiling nor heating, and is quickly "dissolved" (using the word in its commonly accepted meaning) without prolonged soaking. In order that the fruit or fruit acid may be added at once, it is better to "dissolve" the "Snow."

The method of using "Snow" is, to add it to the granulated sugar required under the formula. When these are well mixed, add water slowly, stirring or agitating briskly till the mixture becomes like thick cream. Then, while continuing to agitate, add the remainder of the water required under the formula. Fruit or flavor, fruit acid technically known as citric acid, and color are then added, the whole well mixed and then poured into the freezer.

It should be drawn into packer cans lined with paper liners.

If a power mixer is used, the agitator should be run about one minute for the granulated sugar and "Snow," and about five minutes, while the water is slowly added until it has the consistency of cream. Then add the remainder while still agitating.

Formulas for Ices and Sherbets, with the correct proportion of "Snow," see Index.

To reinforce gelatin in lean Ice-Cream mixes, "Snow" should be added instead of increasing the gelatin beyond the reasonable limitation of the table on page 60. A greater proportion of gelatin might affect the taste. That table shows the correct use of "Snow" in the lean Ice-Cream mixtures which lack body and shipping quality. The formulas on pages 124 to 138 illustrate such use. If it is wanted merely to reinforce a weak gelatin, a half ounce to an ounce in the 5-gallon mix is usually ample. The Meloine allowance remains unchanged.

"ICEBERG"

Heller's "Iceberg" is a preparation for making delicious Sherbets, Punches and Ices, complete with color and flavor. It is fully described on page 360.

FLAVORS, FRUITS AND EXTRACTS

The importance of flavor is apparent when we reflect that all classification of Ice-Creams, fruit ices, sherbets, parfaits, and other frozen products is by flavor only. Texture, consistency, and color, important as they are, serve only as the vehicle which safely and temptingly carries the flavor. With flavor and texture right, other faults are apt to be ignored.

The flavoring substances used may be synthetic or chemical flavors or they may be true extracts, spices, sugars, sirups, fruit juices, crushed fruits, and nut kernels. Perhaps 95 per cent. of all Ice-Cream is flavored with vanilla or vanilla-like flavors. A considerable part of this standard mix is used in making chocolate (or rather cocoa), nut, and some of the fruit Ice-Creams. Various flavors, such as are included in Zanzibar-Brand Flavoring Extracts and Heller's Flavoring Emulsions, make up the bulk of the 5 per cent.[1]

The order of preference of the flavors in America varies somewhat with the seasons and localities. Vanilla predominates at all seasons to such an extent that many small manufacturers do not make Ice-Cream of any other flavor whatever. In large production, vanilla, cocoa, and either strawberry or one of the water ices, usually orange, are found indispensable. This is especially true where three-layer bricks are pro-

[1]Compare article in Ice-Cr. Trade Journ., Aug. 1925.

duced. With such modifications, the order of preference in flavors of the principal Ice-Creams and other frozen products is about as follows:

Vanilla
Cocoa
Strawberry
Peach
Pineapple
Fruit Ices and Water Ices, all flavors.
Other Ice-Cream Flavors
Sherbets
Parfaits, mousses and other specialties.

The number of flavors to prepare varies with demand and equipment. Many small batches are necessarily costlier than one large batch. It is costlier too to maintain cabinets for a number of special flavors in addition to the accustomed vanilla, cocoa and strawberry. Nevertheless, it is found highly profitable to run an extra flavor daily or once or twice a week, and that extra flavor might well differ from time to time, to suit the season. Just as the restaurant advertises "Special beef roast today," so the Ice-Cream parlor can attract many new customers with a neatly written window card calling attention to "Special Tutti-Frutti Ice-Cream today," or immediately before new peaches are due, "Peach Ice-Cream special to-day."

It must not be assumed that there is only one standard of effectiveness in flavoring. Tastes, like Ice-Creams, differ proverbially. Around schools and industrial plants intensity of flavor is desirable, while the other extreme may appeal elsewhere. What seems good to one element may seem either insipid and flat or over-flavored to another.

More important is regional taste. Eastern states and the immediate vicinity of dairy centers demand a mere suggestion of delicate flavor and color. Southern states and other sections that are beyond the reach of fresh milk and cream, demand intense, strong flavors and colors.

These demands are created by unavoidable circumstances and conditions. Where fresh, clean milk and cream of low acidity are abundantly available the mix is apt to have a delightful flavor and aroma of its own which would be impaired by the use of crude or excessive flavoring. There is little need of milk concentrates under such circumstances, and the manufacturer should be slow to select Ice-Cream formulas which employ any considerable proportion of them.

On the other hand, the age and condition of the available milk and milk products may be such that the delicate flavor of quality Ice-Cream is impossible. Beyond the shipping radius of large dairy districts, the manufacturer may be forced to depend more or less completely on milk concentrates which may introduce quantities of undesirable bacteria or which may give the mix a "cooked" flavor. Weak or inferior gelatin may be in use which requires a larger proportion than our formulas call for and so affects the flavor. If the mix is otherwise pure

and wholesome, any disagreeable flavor and aroma which cannot be avoided may be masked more or less successfully with an increased proportion of flavor or with a stronger, more fragrant variety.

For these reasons, we consider it advisable to omit the quantity of vanilla and other flavoring in the formulas, contained in this Guide. Even if very inferior flavors are used, the accuracy of the calculations will not be materially affected, and the standard of the resulting Ice-Cream will be the same, to all practical intents and purposes.

The increase of flavoring used with milk concentrates depends on the intensity of the "cooked" flavor which may need to be obscured or masked. Therefore the flavoring calls for special care when new supplies are bought, until their quality and action are definitely determined. It may be necessary to increase any flavor allowance with the increased use of powdered milk or condensed milk. But the careful Ice-Cream maker will increase his flavor allowance slowly, while stirring thoroughly, and taste the mix, from time to time, before adding more flavor.

Flavoring to taste or by guess, day after day, is an all too common practice which has no justification in modern efficiency. Every man's taste changes with his frame of mind and physical condition. The changing moods are reflected in the proportion of flavoring material added to the mix. Optimism and good cheer always urge an extra dash. The result is irregular and uncertain and cannot promote a steady growth of business; neither is correct stock accounting possible under the circumstances. B. Heller & Company's flavoring extracts and emulsions are accurately standardized and do not vary. There is a definite quantity to produce the exact flavor most relished in a community. Determine that by careful experimentation, have a measure made to contain that exact quantity for each batch, and then do not stint that nor add anything "for good measure." Such methodical regulation avoids waste; it is fair to your trade, fair to yourself and fair to your supply house.

The time to add the flavor of the mix is just before or during the operation of freezing. Better distribution of flavoring extracts and emulsions is obtained if they are dissolved in a small part of the mix and then stirred into the batch. It is sometimes argued that pure vanillas blend more thoroughly with the mix when added before pasteurizing. It is claimed that that process does not impair them and that homogenizing, viscolizing and emulsifying improve them. Their fragrance may seem temporarily lost in the extremes of heat and cold while processing, freezing, and hardening; but it is argued that it develops again as the Ice-Cream begins slowly to melt when served.

Whatever the merit of such arguments, standard practice continues to add all flavors just before or during freezing. If they are added in the aging vats or tanks, thorough agitation of the mix is imperative before any is drawn off for freezing, and from time to time during the drawing off process. This is important also in that it avoids the separa-

tion of the milk fat or butter fat and avoids possible variations between freezer loads.

Fruits and nuts are chopped and added through the fruit funnel of the freezer when the mix is about half frozen. This is particularly important in the case of acid fruits and tub or vertical freezers.

VANILLA, VANHELLER *and* THEIR IMITATIONS

PURE VANILLA EXTRACT.

The most universally useful of all food flavors is vanilla. It is the principal flavor in cooking and baking. In the Ice-Cream industry, it flavors the vast bulk of the Ice-Cream itself and of parfaits, mousses, plombieres: it amplifies the flavor of chocolate Ice-Cream, non-acid fruit ices and frappes known under other names. Through intensive advertising or local circumstances, other flavors may temporarily gain first place in isolated cases; but eventually the public demand reverts to vanilla.

The commercial flavor is obtained from the vanilla bean, a tall, climbing orchid which is a native of tropical America. The better kind is grown in commercial quantities in only one small area, between the Nautla and Tuxpan rivers, southeast of Tuxpam in the State of Vera Cruz, Mexico.

The finest grades of the beans are the limited proportion that are grown in the shelter of forest trees, on rich, sandy soil that is not too thoroughly drained. The demand is so great that the bulk of those in unguarded places is pilfered months before maturity. Out of the properly ripened and cured portion a further selection is made to meet the sanitary and other requirements best described as the Heller XXXX standard. The delicate aromatic flavor of this vanilla is beyond the conception of anybody who has not actually used it. This is necessarily somewhat higher in price, but it gives a touch of exquisite daintiness that distinguishes it from coarser, cheaper vanillas. It is a trade-bringing flavor that is not readily forgotten.

The extremely limited supply of the finer grades of Vera Cruz (Mexican) vanilla beans does not go far in supplying a world-wide demand. Other central and South American sources are drawn upon. Vanilla planifolia and related species have been transplanted to other tropical countries of both hemispheres. While the supply of flavor has thus been increased, notably from islands of the Indian and Pacific oceans, the quality of the Tuxpan River product remains unequaled elsewhere, even when climate, soil, and humidity seem identical.

To meet the demands of those who require a pure vanilla of lower price, the finest grades are skillfully blended to produce such brands as our Ice-Cream-Makers' Special Pure Vanilla Extract and Heller's $1,000.00 Guaranteed Pure Vanilla Extract.

The U. S. Standard for vanilla extract, at present requires that the flavor be obtained from the vanilla bean (Vanilla planifolia, Andrews), with or without sugar or glycerin, and that the extract contain, in 100 cu. centimeter, the soluble matter of not less than 10 grams vanilla bean.

IMITATION VANILLA

The great bulk of the vanilla-like flavor used in the Ice-Cream industry is not obtained from Vanilla Beans. There are three principal reasons for this: first, a stronger flavor than pure vanilla is demanded, one which will more effectively overcome the "cooked" flavor of milk concentrates and other undesirable tastes introduced with ingredients, or developed in storage ripening; second, the demands of the consumer of limited means and the increasingly keen competition make it necessary to keep the cost of ingredients at the minimum; and third, a comparatively inexpensive flavor is required which will not readily freeze out.

The flavor of B. Heller & Company's Vanheller, Van Bouquet and Vaniloid is similar to that of pure vanilla and, as they are made specifically for use in Ice-Cream, they are considered more practical. These flavors have the smoothness of pure vanilla. They will go through the intense cold of the hardening room without crystallizing and remain in solution when the Ice-Cream or other frozen product melts in the mouth. A favorite flavor with large manufacturers who desire a rich, strong flavor at low cost, is Heller's Van Bouquet.

Concentrated flavors are favored by efficient Ice-Cream makers to save transportation and storage space in large operations.

These concentrated flavors are Vaniloid, Heller's Van Bouquet, Concentrated, and Ice-Cream Makers' Friend in Dry Form.

CHOCOLATE FLAVOR

Of the three standard Ice-Cream Flavors, chocolate (or rather cocoa) is second in importance. It is always seasonable and it is not restricted to any region or locality.

Cocoa is used in most "Chocolate" flavored Ice-Cream. It forms a liquid more easily than hard cakes of chocolate and its component parts are more easily standardized and rendered uniform. Cocoa fat is not a dairy product and must not be calculated as milk fat or butter fat. It would not be advisable, therefore, to have excessive quantities of so-called cocoa butter, especially in mixes of 10 per cent. butter fat or more: such mixes, if properly standardized, contain more than ample milk solids for all purposes.

The use of chocolate instead of cocoa would not improve the mix in any sense: it would constitute a waste. Cocoa-butter has no value as a flavor. The same is true of chocolate liquor: efficient Ice-Cream makers prefer to buy the cocoa to make the sirup or liquor themselves, saving the profit on the added water and sugar, saving increased freight charges, insuring suitable proportions of ingredients, and avoiding the specks which chocolate and chocolate liquor may cause.

Cocoa is obtained by roasting and grinding the seed of the Theobroma cacao. Theobroma is the generic name, meaning "Food of the gods": cacao is the native Mexican name of the species.

The cacao is an evergreen tropical tree which thrives in shaded, moist, warm situations, from Mexico to Brazil. The nearer the equator, the better the quality. The tree may grow to a height of 20 to 30 feet, though it is usually from 12 to 18 feet high and 5 to 8 inches in diameter. The small, pinkish white, waxen blossoms, sprouting directly out of the trunk and heavy branches, are replaced with seed pods which

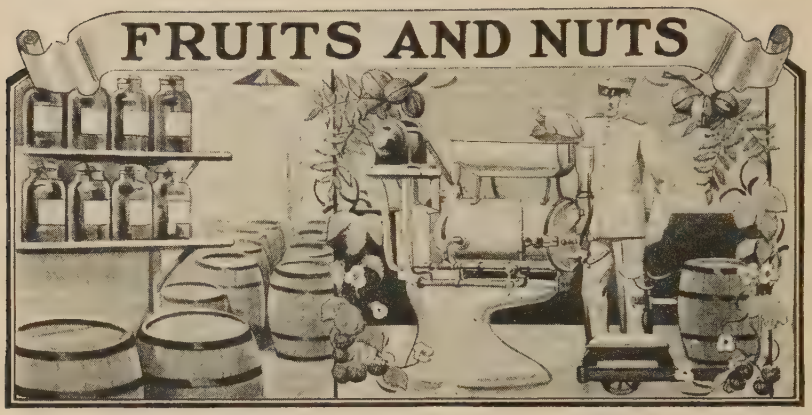
resemble pointed musk melons, 2 to 6 inches thick and 8 to 15 inches long. The pulpy pods are gathered with the aid of pruning hooks and each yields from twenty to forty closely packed seeds which resemble almond kernels. These are removed from the pulp, carefully sweated (fermented) for proper aroma, washed, and then dried and cured on sunlit floors until the prized cinnamon-red color is developed.

The seeds for Zanzibar-Brand Cocoa are roasted and cracked or lightly crushed that the so-called nibs may be more perfectly and completely separated from the eyes (germs) and shells. The importance of this may be judged from the fact that the federal standard was recently revised to guard the buyer against the almost worthless shell matter.

The nibs are thoroughly cleaned by fanning and then pressed and the cocoa butter in them is modified to meet the definite, uniform proportion best suited for use in an easily digested Ice-Cream. The pressed cocoa is then ground to fine powder, chemically treated and bolted through fine silk sieves to render it quickly soluble (or rather miscible) into sirup and to insure an Ice-Cream without specks.

The United States standard for cocoa shows on the moisture-free and fat-free basis,

Total ash, not more than	8 per cent.
Ash insoluble in hydrochloric acid, not more than	0.4 per cent.
Crude fiber, not more than	7 per cent.



FRUITS AND FRUIT FLAVORS

Luscious fruits appeal to the eye much as good Ice-Cream appeals to the taste. Combining the two, each augments the deliciousness and the dietary value of the other. The particular vitamin which cures and prevents scurvy is apt to be low in a mix which has been heated to a high temperature, but fresh or cold packed fruit restores it. It is not surprising, therefore, that Fruit Ice-Cream and frozen puddings are an important part of the output wherever they are properly made. The visible evidence of fruit is demanded by many, at least in season, and they willingly pay 50 per cent. additional for properly made Ice-Cream that has it in suitable proportion.

The principal fruits used are strawberries, peaches, cherries, pineapple, raspberries, grapes, apricots, and plums. Others are used, both in Ice-Creams and in fruit ices, but chiefly by special-order caterers. The fruits and berries native to the vicinity are apt to be most popular in commercial Ice-Cream: strange or exotic fruits can be handled profitably on a very limited scale only, principally by caterers.

To prepare them for use, select ripe fruits in prime condition, wash them carefully, hull, pit, peel, and chop them. While chopping does not bring out the flavor as well as crushing, the fruit is more apparent and the flavor can be accentuated with a little citric acid solution, or intensified with the help of Zanzibar-Brand Flavoring Extracts or Heller's Flavoring Emulsions.

Strawberries and other berry fruits have but poor keeping quality unless they are promptly cooled after picking. The keeping quality of strawberries is doubled for every 15 degrees fall in temperature: for

example, a berry that would keep one day at 85 degrees F., would keep two days at 70 degrees, four days at 55, and eight days at 40 degrees. This explains why berries should preferably be picked in the cool of the early morning. Remove possible sand from strawberries, either in special berry washing machines or by washing them in a colander. Remove the seeds from crushed red raspberies with a sieve or fine-mesh colander.

Peaches should be split, pitted and preferably either pared by hand or blanched by putting them into boiling water for a period of 1 to 2 minutes and rubbing off the skin. This blanching method is less wasteful and sets the coloring matter of the pulp. If they are peeled with lye, immerse the peeled fruit for a minute in a 0.5 per cent. solution of citric acid to neutralize the alkalinity of the lye: otherwise the outer flesh will turn dark.[1]

Cherries must be both stemmed and pitted. Maraschino cherries are sulfur bleached and then colored. While all trace of the sulfur dioxide has probably been washed off, it may be desirable to wash them again.

Pineapple is more economical in the shredded form. In case you buy it whole or sliced, better chop it or cut it in small cubes for better appearance.

Apricots and plums should be pitted and worked through a sieve or colander to remove the skins.

Apples and pears must be either peeled or put into boiling water for a period of 1 to 1½ minutes, whereupon the skin may be readily removed without waste.

To conserve fruits for future use in Ice-Cream, they may be cold-packed with or without sugar, cold-packed in water, kettle packed, sun dried, dehydrated, canned, preserved, or candied.

Cold-packed fruit is suitable for standard and fancy Ice-Creams, sherbets and ices. For these purposes it is usually packed in 5-gallon and 7-gallon kegs and in 30-gallon and 50-gallon barrels. Two pounds fruit to one pound granulated sugar is the most practical and most popular proportion, though three to one and four to one are also available. Greater proportions of sugar than that in the two-to-one pack cannot be used in the standard mix.

All fresh fruits which are commonly in demand for Ice-Cream making can be put up in the two-to-one cold pack. Use water-tight, clean, odorless containers. If metal is used, it must be enamel lined or have the interior well lacquered. If kegs or barrels are used, brush the dry interiors with hot paraffin. Select prime ripe fruit from which defective specimens have been removed: wash, hull, stem, and pit it. If large containers are used, such as kegs, barrels, or large crocks, pre-cool the

[1]E. L. Overholser, pomologist, and W. V. Cruess, fruit products, U. of Cal.

fruit and pre-cool the sugar and the containers at 32 degrees F. The fruits may be cooled in trays or by spraying with ice-cold water, but it should be done promptly when they are received. The keeping quality is enhanced and the flavor and appearance improved by crushing the fruit before packing. Weigh in the fruit and sugar carefully for it is impossible to standardize your mix properly unless this is carefully and fairly evenly done, throughout the container.

A 5-gallon keg contains 3 gallons 7.56 pints crushed fruit and 16 2/3 pounds sugar; a 7-gallon keg contains 5 gallons 4.18 pints crushed fruit and 23 1/3 pounds sugar; a 30-gallon barrel contains 23 gallons 5.36 pints crushed fruit and 100 pounds sugar; and a 50-gallon barrel contains 39 gallons 3.6 pints crushed fruit and 33 1/3 pounds sugar. The average weight of fruit is 6.86 pounds per gallon before crushing and 8.8 pounds per gallon after crushing: and that is the weight upon which our tables are calculated. The actual variations from this are not enough to affect practical results.

Pack alternate layers of fruit and sugar, ending with sugar. If the fruit is to be used whole and uncrushed, fill the container without sugar and add syrup enough (containing 30 per cent. of granulated sugar) to cover all the fruit completely, which will take about one-third the volume of the container. When the container is full, head it up or seal it tightly. Leave a small hole in the top for the escape of possible gas: this should be corked or otherwise sealed when the contents are completely frozen. After closing, promptly remove the containers to as near an even temperature as possible, preferably between 10 and 15 degrees F. The more promptly and quickly the several steps are taken after the fruit is packed, the more certain and perfect the results. If these instructions are followed, there should be no fermentation and the flavor and aroma as well as the color of the fruit should not deteriorate in eight to twelve months' storage.

Frozen fruits should be used in the frozen state or as soon after thawing as circumstances permit. They begin to deteriorate in twelve hours after thawing.[1] Repeated freezing and thawing hasten decomposition.

Each gallon of 2 to 1 cold-packed fruit contains 0.78903 gallon (about 6¼ pints) of fruit and 0.21097 gals. (about 3⅛ pounds) of sugar.

Kettle-processed fruit, concentrated by cooking off sufficient moisture to reduce the weight 10 per cent., can be used in an emergency for purposes for which fresh and cold-packed fruits are used. The concentration is effected in open kettles or in vacuum. The natural flavor and aroma and the fresh color are injured in either way, but more particularly in the open kettle method, which is the prevailing one. No sugar or sirup is used and the fruit is ordinarily put up in No. 10 (107-ounce) and 5-gallon sanitary enamel-lined cans. In our table for the use of kettle-processed fruit, no provision is made for restoring the moisture

[1]E. L. Overholser, pomologist, and W. V. Cruess, fruit products, U. of Cal.

lost in concentration. The difference is of no consequence and not worth the labor required to restore the moisture.

Dried and dehydrated fruits are useful in fancy Ice-Creams and in sherbets and ices. Raisins, prunes, prunelles, figs, and dates are used in this way. The first three require cooking to bring out the flavor, though two of our Raisin Ice-Cream formulas show a method of bringing out the flavor without cooking. (See "Tutti-Frutti Ice Cream No. 2" and "Plum Pudding, No. 1.")

Fruits which have been spread in the open for sun-drying are known as "dried" fruits: they are superior in flavor and appearance. Those which have been dried by various indoor methods are known as "dehydrated" fruits: they are inferior in flavor and appearance, and yet this method becomes necessary where climatic conditions interfere with proper sun-drying. Recent work in California would seem to show that the reverse is possible in dehydrated prunes: namely, that they are larger, weigh more, and are better relished than sun-dried prunes of equal moisture content.[1]

Canned fruits, for use in Ice-Creams, ices and sherbets, are put up in No. 10 lacquered cans, containing 0.836 gallon (107 fluid ounces). Pineapple is available in No. 8 and No. 10 cans. Being cooked in sirup and sterilized, canned fruits are inferior in flavor, aroma and appearance, and should not be used if fresh or cold-packed fruits are available. Canned fruits are pretty well standardized, being usually put up in five grades: fancy, choice, standard, second and pie. Only the first four of these can be used in Ice-Cream business, and the manufacturer who prides himself in his product will not fall below the "standard" grade.

The strength of the sirup is highest for the "fancy" grade and ranges from that down to clear water for the culls packed as "pie" grade.

Apricots, yellow cling peaches, yellow free-stone peaches, sliced peaches, and plums, are available in the following grades:

Grade	Sirup (Per cent. of sugar in sirup when packed)
Fancy	55 per cent.
Choice	40 per cent.
Standard	25 per cent.
Second	10 per cent.

[1]A. W. Christie, food products, U. of Cal. Exper. Sta., in Annual Rept. 1923.

Black cherries, white cherries, Royal Ann cherries (red used as Maraschino), grapes, and pears, are available in the following grades:

Grade	Sirup (Per cent. of sugar in sirup when packed)
Fancy	40 per cent.
Choice	30 per cent.
Standard	20 per cent.
Second	10 per cent.

Strawberries and other berry fruits are available in the following grades:

Grade	Sirup (Per cent of sugar in sirup when packed)
Fancy	60 per cent.
Choice	45 per cent.
Standard	30 per cent.
Second	15 per cent.

Preserved fruits are usually equal parts sugar and fruit, and thoroughly cooked. The natural aroma and fruit flavor are changed to a distinct preserved flavor, exceedingly sweet. They cannot be used in the standard Ice-Cream mix on account of the excessive proportion of sugar. Caterers sometimes freeze them into the centers of bricks and forms, or between layers of Ice-Cream; but even there, other manner of conserved fruit would make a better flavored and less cloying filler.

Preserved citron is an exception and, after pouring off the sirup, can be used in sherbets and Ice-Creams.

Candied or crystallized ginger, citron, orange peel, and lemon peel are well adapted to use in fancy Ice-Creams and sherbets. Other candied fruits lack sufficient strength to carry any distinctive flavor into the product.

The tamarind, pressed in sirup, is not crystallized, but it may be used in sherbets and ices.

Fruit juices, for the use of the Ice-Cream trade and others, may be cold-packed, concentrated or powdered.

Cold pack orange and lemon juice generally contains 5 lbs. of added sugar to each gallon of juice. This makes the percentage of added sugar in the orange juice 36.5 and in the lemon juice 36.75. The cold-pack juice commonly contains a preservative, usually 1/20th of one per cent. of benzoate of soda.

Concentrated orange juice, especially when fresh fruit is out of season, is a convenient product for the Ice-Cream makers' use.

It usually contains no added sugar or preservative, and is concentrated to a uniform density, six volumes of fresh juice making approximately one of the concentrate. It weighs 11.3 pounds per gallon.

Fresh juice, without a preservative, when kept at a temperature of 40 or 45 degrees F. spoils in from 24 to 30 hours. The concentrated juice has been kept in good condition for one year at 35 degrees F. and could probably be kept in good condition at that temperature for twice as long. Kept at 40 to 45 degrees F. it probably would remain in good condition for a year.

Powdered lemon juice is a new product, made practically as powdered milk is made, and is very nearly free of moisture. It keeps well and can be used whenever lemon juice is called for.

Extent of Fruit Juice Reduction

1 pint cold-pack lemon juice	6 lemons
1 pint powdered lemon juice	84 lemons
1 pint cold-pack orange juice	4 oranges
1 pint concentrated orange juice	23 oranges

The flavoring of the mix cannot be left to fruit alone: it would require so large a proportion of fruit that the Ice-Cream flavor and appearance would be lost; it would reduce the milk-fat content below standard requirements; it would reduce serum solids below the proportion needed for body and proper swell; it would make a soggy, coarse, and impractical Ice-Cream; it would make it impossible to use the regular vanilla mix as a base: finally, it would raise the cost of the product above the possibility of commercial profit and make it prohibitive in price as a universal dessert or refreshment.

The use of a fine quality of Flavor or Flavoring Emulsion makes it possible to reduce the fruit requirement by one-half without noticeable loss of the flavor and aroma of the fresh fruit. This provides ample fruit to make an Ice-Cream pleasing to the eye and makes it possible to use part of the regular vanilla mix in making it. The formulas on pages 270 to 289 are calculated for practical use and perfect results, providing for only the necessary proportion of fruit and leaving the exact proportion of flavor or emulsion to local conditions and requirements. Go slowly, when you use Zanzibar-Brand Flavors or Heller's Flavoring Emulsions, and use them sparingly, for a little goes a long way. It will be found that orange, peach and pear need more fruit or flavor than strawberry, pineapple, currant, green gage plums, and such, and that fruit acid solution can be used with them to better advantage.

Nevertheless, custom and competition require a larger proportion of strawberries than of other fruits and our formulas follow the general practice.

Taste the mix repeatedly while adding the flavor, little by little out of a graduated glass (in the case of Emulsions, from the point of a knife blade or spatula), that the exact quantity used may be determined for another time.

THE ACIDITY OF FRUIT

In its relation to the proper apportionment of sugar.

Fruit acidity differs greatly in the many kinds of fruit and in the different varieties of the same fruit.

During the development of the fruit, its acidity is affected by climate, weather conditions, and methods of cultivation. For instance, in the United States the ratio of acidity to sugar in wild strawberries is, on the average, 1 to 2: in the cultivated strawberries it is 1 to 3½. In Europe that ratio in cultivated strawberries is 1 to 9. As is well known, a wet winter and a dry summer makes sweet grapes, and reverse conditions cause them to be relatively sour.

After the fruit is gathered, its acidity is modified by atmospheric conditions, by the length of time that elapses before the fruit is used, and by the method of preparing for use. Cooked fruits require much more sugar than do uncooked fruits. If the sugar is cooked with the fruit, the increase should be from 33 1/3 to 100 per cent.; if added after cooking, much less.

Fruit acidity is such a variable quality that definite and positive information regarding it is of necessity lacking and only general and relative data concerning it is available. This data consists of numerous analyses of fruits from many sections made by competent chemists and, so far as such work can be, it is scientific and dependable. From it, the table on page 92, which gives the relative acid and sugar content of the principal fruits used in making fancy Ice-Creams, Ices, Sherbets, etc., has been worked out.

The calculation of the added sugar required by each fruit is based on the relative acidity and sweetening value. Such added sugar is primarily to offset excess acidity and to bring out natural flavor. In arriving at the definite scientific quantities, the following factors had to be taken into consideration:

1. **The acidity of the fruit** unmodified by any sugar content. All fruits contain from one to at least nine different acids of varying strength. Citric, malic, and tartaric are the chief fruit acids and contribute much to the characteristic flavor of the fruits; the others are usually merely subordinate. To determine the exact comparative acidity of each fruit, all the various acids contained in a given fruit had to be given a common or like standard of measurement. Thus the acid value is given "in terms of malic acid," the quantitative determination.

2. **The fact that the different acids require different sugar equivalents to offset their acidity.** Thus malic acid requires ten times its weight in sugar; citric acid, twelve times its weight; and tartaric, thirty times its own weight. This may be termed the effective determination.

3. **The natural sugar content of the fruit.** This includes cane sugar, invert sugar, and various reducing sugars, each with its definite sweetening value differing from the others, but all in terms of cane sugar as a standard of measurement.

4. **The increase of sweetness due to inversion of the cane sugar of the fruit.** This varies from 0.01 per cent. for apples, oranges, and red raspberries to 0.23 per cent. of the original cane sugar in raisins.

5. **Loss of sweetening power due to absorption** of a minute proportion of the added cane sugar by fruit solids, which contribute nothing to the flavor because they are not chewed. This proportion is measured by the extent to which the original cane sugar of the fruit is combined with its other solids. This ranges between 8 per cent. of the sweetening value of cherries to 30 per cent., that of strawberries, equivalent to 0.04 and 0.18 per cent. respectively of the whole fruit. In the case of grapes, there is no loss by such absorption; on the contrary, there is an intensification equivalent to about 5 per cent. of the sweetening value, or 0.75 per cent. of the whole.

6. **The quantity of added cane sugar necessary to bring out and enrich the characteristic flavor of each fruit, based on actual experience.**

Do not allow crushed fruits, fruit juices, cider, and their products to stand in galvanized iron containers—not even for a short time. It is much better to use wooden buckets, copper pots and kettles, and sanitary piping. Ice-Cream packer cans and freezers are safe if they are kept tinned. Fruit acids attack the zinc of galvanized iron and dissolve it. That would give a disagreeable taste to the contents and might cause vomiting, due to zinc poisoning.[1] For the same reason, packer cans should be well and completely tinned or they should have a liner inserted as a protection.

[1]Bur. of Chem., U. S. Dept. of Agric., Aug. 4, 1923.

Sugar Required to Offset the Acidity of Fruits[1] and to Bring Out Characteristic Flavor.

Fruit (net edible portion, without waste)	Solids (per cent.)	Moisture (per cent.)	Acidity equivalent in terms of malic acid (per cent.)	Sweetening value of fruit in terms of granulated cane sugar solids	Added sugar required (per cent. of weight of fruit)
Apples, dessert	19.64	80.36	0.65	10.76	30.73
Apples, sour			0.71	6.27	45 (est.)
Apricots	10.53	89.47	0.95	11.10	41.50
Bananas, yellow	32.90	67.10	0.11	25.54	10.43
Blackberries	15.40	84.60	1.41.	4.64	44.46
Blueberries	18.10	81.90			
Cherries [2]	19.40	80.60	0.71	10.02	35.27
Cranberries	11.40	89.60	2.30	1.51	56.49
Currants, red	15	85	1.43	5.50	44.50
Dates, dried	81.50	18.50	1.30	34.94	15 (est.)
Figs, dried	71.20	28.80	0.70	74.64	6.5(est)
Gooseberries	16.40	83.60	1.41	8.03	40.95
Grapefruit					
Grapes	19.21	80.79	0.80	15.38	39.20
Huckleberries—See, Blueberries					
Lemon [3]	17.40	82.60	5.16	0.04	86.56
Loganberries	15.20	84.80	1.45	4.47	45.07
Orange [4]	15.70	84.30	1.07	5.71	40
Peaches	23.75	76.25	0.72	8.78	45
Pears	13.65	86.35	0.31	8.87	32.50
Pineapple [5]	14.17	85.83	0.90	9.58	31.42
Plums [6]	16.56	83.44	0.81	9.34	44.95
Pomegranates			0.823	12.08	37 (est.)
Prunes, dried	70.70	29.30	2.72	44.35	17.85
Raisins, dried	73.66	26.34	1.38	62.91	8.76
Raspberries, red	15	85	1.50	4.31	45.68
Rhubarb, small stalks	6.20	93.80	0.07	0.30	35.20
large stalks	4.80	95.20	1.62	5.42	40.46
Strawberries	10.30	89.70	1.40	5.42	62.23

[1]Fruits vary greatly. The fruits, for which figures are given, are of the general average of American commercial fresh fruit of the grade which, when canned, would be denominated "standard."

[2]Analyses are of Black Tartarian and Royal Anne cherries, but the figures given will apply, as a rule, to any good American sweet cherry suitable for canning. Cherries contain an average of 84.6 per cent. juice.

[3]The average lemon consists of rind, 38.5%; pips or seeds, 2.3%; flesh (including juice), 59.2%.

[4]The average California or Southern orange (excluding the seedless) consists of rind, 27.8%; flesh (including juice), 71%; pips or seeds, 1.2%.

[5]Average for fruit from Florida, Cuba, Porto Rico, the Bahamas, Jamaica, and Hawaiian Islands.

[6]Green Gages, Washington, Egg, and similar varieties of plums.

NUTS AND NUT FLAVORS

The researches of science indicate that the human race first subsisted exclusively on fruits and nuts. To this day, Samoans and other South Sea Islanders subsist almost entirely on the milk and meat of coconut. The Chinese believe that the vegetable oils contained in nuts have the property of preserving vitality and prolonging life.[1] Their infants, when not nursed in the normal way, are fed "walnut milk," which consists of walnut paste and water.

Nut Ice-Cream is not merely a well-balanced food, the nuts adding both energy and tissue building proteins, but it is also a most pleasing form of the frozen dainties. This is so well realized by dealers and consumers that Ice-Creams which contain no nuts are frequently served with a sauce that contains them.

The way to obtain the full flavor of nuts would be to grind them into a paste. But the eye demands the visible evidence of the presence of nuts and, for that reason, nuts are merely chopped, and not too fine either, that the consumer may experience the delight of biting into the nut meat. The psychological effect is more valuable to the dealer than the unseen and unfelt presence of the finest nut paste. The lack of flavor can then be made up with one of our nut flavors: only go slowly, adding a very little at a time and tasting the mix after each addition, for our flavors are of unusual strength. The proportion of nuts provided for in our formulas is based on this addition.

The principal nuts used in Ice-Creams, frozen puddings and sherbets are, in the order of their importance, walnuts, black walnuts, pistachio (with almonds or beech nuts as an alternative), pecans (with hickory nuts, butternuts, and Japanese heartnuts as alternatives), almonds, marrons (with the much better though smaller American chestnuts and chinquapins as alternatives), peanuts, hazelnuts, (with filberts as an alternative), and coconuts.

To prepare them for use, select clean, sweet, seasoned nut meats or whole nuts with plump kernels that are free of rancidity, interior discoloration, mold, and worm holes. Unless nuts are bought as nut meats, the two halves of the shell should be firmly united on all sides so as not to expose the kernel.

All nut meats bought shelled should be spread for careful hand picking before they are used. Bits of shell, and even small pebbles may be found among any of them. If one of these got between the teeth of the consumer, it would condemn the Ice-Cream.

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[1] P. W. Wang, Kinsam Arboretum, Chuking, China, in letter to Nor. Nut Grs. Assn., Aug. 12, 1922.

The inner skin (pellicle) which covers the kernel should be removed when too conspicuous, as in the case of almonds, pistachio, and hazelnuts, and when it has an objectionable flavor, as in the case of the bitter inner skin of Brazil nuts. The removal of this inner skin is known as blanching. In the peanut such blanching presents no difficulty.

Method of blanching almonds, pistachio and other nut kernels with an objectionable, clinging inner skin. For each person that is ready to rub off the skins, drop ¼ pound at a time into 1 pint boiling water. Pour off the water within a few seconds and, while still wet, rub off the skins with the fingers, leaving the kernels white, firm and hard. If they are boiled longer, the kernels become soft and yellow. If they are left in either hot or cold water too long, they are apt to become water soaked: for that reason it is better to blanch in small lots. In large operations, investment in a blanching machine is warranted. To blanch such obstinate nuts as the Brazil, use olive oil instead of water and heat it to the same degree, for boiling in water only water-soaks them without loosening the skin. Any kind of nut needs to be cooled only enough to admit of handling in rubbing off the skin. Nuts that are to be ground must be blanched several days before, to give them time enough for thorough drying. Do not blanch or grind more than you intend using within a day or two.

Walnuts can be used in every form of Ice-Cream, ices, sherbets, frozen custards, and frozen puddings. They hold the same pre-eminence among nuts that vanilla holds among flavors. Many Ice-Cream makers use no other nuts whatever, even using them in small pieces to replace pistachio and almond, depending on our flavors and colors to satisfy the eye and palate. Walnuts are mild in flavor, easily cracked, and readily available at moderate cost, particularly since the heavy plantings of the Pacific coast have come into commercial bearing.

In buying walnuts, even more than elsewhere, the best is the cheapest. **A single rancid or moldy nut may waste your best endeavor to put out a superior product.** More than 10 per cent. moldy kernels or otherwise poor nuts makes them "near-grades," which lowers their value 30 to 35 per cent. below the value of first-class nuts. More than 25 per cent. moldy or otherwise poor, makes "culls" of the lot, worth fully 60 to 65 per cent. less than first class nuts.[1] The most convenient way to buy them is as walnut meats, halves, and broken pieces, though they may also be bought cracked and whole. The meats may be in small pieces if they are clean, as they are generally chopped anyhow, but not too small. The grade or variety of the nut is more important. Buy first class commercial nuts of the so-called "budded" grade, or the best of the varieties sold in special grades. A soft shell is easily broken in handling, while others may tend to separate at the seal of the halves in grading and packing. A nut with a broken shell or one which is partly open at the seal, soon becomes rancid. An excellent variety of walnut is the Eureka. It has a thick shell, perfectly sealed on all sides, completely filled with a

[1]Bul. 367, U. of Cal.

cream-colored, plump kernel of rich flavor and less astringent than others. It is an excellent keeper.

The kernels, when used in chopped form, yield but little flavor. It is well to add a mere suggestion of our Walnut Flavor.

Incidentally, the correct name is Persian Walnut: "English Walnut" is a popular misnomer.

In the absence of walnuts, any of the following can be substituted in frozen desserts, provided Walnut Flavor is used—hickory, pecan, butternut, and perhaps Japanese heart nuts.

Pistachio nuts or their flavor and color can be used in every form of Ice-Cream, Sherbets, Ices, and other frozen desserts.

The pistachio nut is obtained from Mediterranean countries and western Asia. It is not grown in important commercial quantities in America. It is nearly, or quite an inch long, formed like the beech nut and the grain of buckwheat, and has a greenish kernel of almond-like flavor: in fact, it is sometimes called the green almond. They are necessarily costly (about 75 cents per pound, wholesale, at this writing) and can be used only sparingly, reinforcing them with our Pistachio Flavor. A little Pistachio Shade Green Color should always be used. The nut should be blanched in the manner described on opposite page.

Where pistachio nuts are not available, a satisfactory similar product can be made by using chopped, blanched almonds or our own native beech nut kernels, and then flavoring and coloring as for pistachio nuts.

Pecans, like walnuts, pistachio, and almonds, are a universal nut which can be used in every form of frozen dessert: in fact, if our Walnut Flavor is used, pecans can be used instead of walnuts, giving a milder and yet a richer tasting flavor. In paste form, they can be used even to replace the imported and costly pistachio, obtaining the distinctive flavor and appearance from a very little of our flavor and of our color.

Pecans are good "keepers", easily shelled in large pieces, and of pleasing flavor. No finer nut exists and it is native to our own country. Now that the top-worked groves are coming into bearing, they are becoming more and more available in quantity, quality and price. Among the medium to large nuts, with thin shell of good cracking property, having a plump kernel rich in quality and of excellent to very good flavor, the Schley, Bidwell, Success, and Burkett rank as the foremost varieties. They can be bought shelled, cracked or whole.

Almonds can be used in all kinds of Ice-Cream and other frozen desserts, either in paste form or chopped in suitable pieces. Like pistachio and Brazil nuts, they must be blanched in the manner described on opposite page before they can be used.

The almond is associated with the human race since the time of its earliest authentic records. In powdered form, it is often included in diabetic recipes. Nuts of fine quality are now grown in this country in

commercial quantities. Of these the Jordan is an excellent variety and the Nonpareil and Crown are very good.

Both sweet almonds and bitter almonds have formulas in our book. It is well always to reinforce them with a very light use of our Almond Flavor. When it is necessary to use other nuts to replace almonds, this may also be done with the use of Almond Flavor.

Chestnuts, chinquapins and marrons can be used interchangeably in all frozen desserts except water ices, and formulas for their use will be found under the various headings.

The marron is a large chestnut of southern Europe and pleases those who originated in Mediterranean countries. The Lyon is the best variety: it is a large, round nut with white meat and thin shell. The various European wild chestnuts are much inferior to the marrons.

The American chestnut, commonly known as the American sweet chestnut, is smaller than the marron, but sweeter and superior in flavor.

The Chinquapin is a smaller form of American chestnut which grows on bushes, as distinct from the other forms which grow on stately trees. Chestnuts grow in clusters of two or three nuts inclosed in a prickly bur, while the chinquapins grow singly, each nut inclosed in its own bur.

All of these may be obtained raw or, as in the case of marrons, canned in sirup. The canned forms are already cooked. Simply rinse them in warm water before chopping and using, or use the highly flavored sirup with the nuts. Our formulas illustrate both methods. The raw forms must first be roasted in a hot oven for ten minutes to bring out their best flavor, which also loosens the pellicle or inner skin so that it will come off easily. Then chop or grind them. Boiling would render them too soft for grinding and the flavor would be inferior.

Peanuts, either broken or in the form of peanut butter, have almost as wide a range of uses as walnuts, pecans and almonds, and formulas for their use will be found under all headings except Water Ices.

Unless peanuts are bought roasted, the Ice-Cream maker must roast them before he can use them. This can be done in an oven or in any way that admits of proper heat control. Commercial roasters heat shelled peanuts to about 320 degrees F. for a period of 40 minutes or more. Seasoned, dry nut meats require less time than the fresh: unshelled nuts require more time; but shelled or unshelled, avoid both over-roasting and under-roasting for palatable results.

Blanch the peanut meats by rubbing off the inner skins as soon as cooled. You can do this without special equipment by simply pouring the shelled nuts forth and back repeatedly, from one container into another, either in the wind or before a fan.

If peanut butter is used, it is well to blend Virginia and Spanish stock for any frozen product in which the regular Ice-Cream mix is used. In sherbets, however, a Virginia or low-fat peanut alone is better.

The grinding can be done in an ordinary meat grinder, using the finest bur or smallest hole plate. Salt is objectionable to some: if it is used, do not add it in greater proportion than 1 to 1½ per cent. the weight of nuts. Do not prepare more than will be used in a week or two, as the oil separates out soon after that and there is a tendency to become rancid, especially when the embryos or germs have not been removed. Rancid peanut butter is very distasteful.

Hazel nuts or filberts can be used in all formulas based on the regular Ice-Cream mix: that is, they can be used in all frozen desserts except sherbets and ices.

The manner of blanching or removing the inner skin is explained on page 94.

The black walnut is a native American nut, far richer in flavor than the English Walnut, but has some serious faults. It has a rough shell, which is very hard and difficult to crack without crushing the kernel, though these faults need not prevent the use of black walnuts in Ice-Cream. The Thomas and the Stabler are improved varieties which are easily cracked so that the kernel can be abstracted whole or in halves. The Thomas has the milder flavor of the two. If black walnuts are bought shelled, see that the kernels are thoroughly cured: otherwise an entire barrel of shelled nuts may become moldy and cake into a solid mass. If the hulls or husks of black walnuts are removed while they are still green, the kernels will not become so black nor strong in flavor.

Japanese heartnuts have a rough shell like that of our black walnut, but it is either heart-shaped or of the shape of a guinea egg. The flavor is like that of our butternut and its uses like that of the pecan.

If the fingers are stained in the husking or shelling of black walnuts, the stains can be removed in the following manner. Dissolve ½ ounce sulphite of soda in 1 quart water to which has been added ¼ ounce hydrochloric acid. If hydrochloric acid is not available, oxalic acid will do. Apply this to the stains repeatedly till they are bleached out. Then wash the hands thoroughly in clean water. Walnut stains in clothes or textiles can be removed by spotting them repeatedly in the same solution and then rinsing them.

Brazil nuts or para nuts are hard shell, long nuts of triangular form. They are imported from the Amazon and Orinoco valleys of South America in such enormous quantities that they sometimes constitute the cheapest nut in the American market.

The shell is completely filled with a large, compact, white kernel of superior quality. In broken pieces, it may be thought too hard for use in any of the frozen desserts; but ground, it can be used for its own worth or to replace any other nut in an emergency. It is well then to support it with walnut, almond or pistachio flavoring. The special method of removing the pellicle or inner skin with oil is explained on page 94.

Coconuts, the largest nuts offered in our market, yield a hard white meat and a sweet "milk", both of which are made use of in some of our formulas. The kernel from which the meat is obtained lines a hard shell and is used either fresh or dry. The dry form is known as copra, and it is that which is used in shredded form.

Composition and Weight of Nuts Used in Our Formulas (Shelled, Edible Portion, Cured)

NUTS	Water (per cent.)	Total solids (per cent.[1])	Weight per gallon as measured with air space [1] (pounds)	Weight per gallon as determined by specific gravity (pounds)
Almonds, unblanched	4.8	9.52	4.156	8.721
Almonds, blanched			4.255	8.904
Beechnuts	4	96		
Brazil nuts	4.3	95.7	4.932	9.271
Butternuts	4.4	95.6		
Chestnuts (incl. marrons, chestnuts and chinquapins)	5.9	94.1	5.4375	9.667
Coconut (fresh) [2]	7.2	92.8		9.667
Coconut (shredded)	3.5	96.5	3.2	5.6889
Coconut milk [3]	92.7	7.3		8.667
Filberts (incl. hazelnuts and filberts)	3.7	96.3	4.667	9.333
Hickory nuts	3.1	96.9		
Peanuts	4.9	95.1	5.044	9.667
Pecans	2.7	97.3	3.667	8.159
Pinon or pine nuts	4.7	95.3		
Pistachio	4.2	95.8	4.741	8.000
Walnut (Black)	2.5	97.5	4.48	8.615
Walnut (Persian or "English")	2.5	97.5	3.556	7.884

1. Atwater and Bryant: American Food Materials: Dept. Bul. 28, U. S. Dept. of Agr. Weights are our own determination.
2. Meat per average nut, 13½ oz.
3. Milk per average nut, 4¼ fl. oz.

COLOR AND COLORING

A pleasing color of foodstuffs is considered desirable. Fruit and flavor do not necessarily produce the characteristic color established by custom. Strawberry Ice-Cream without added color is of a pale pink and appears insipid and flavorless: add two or three teaspoonfuls of our strawberry color to the five-gallon mix and immediately both the color and the flavor appear to have become more natural.

What constitutes a pleasing color is a matter of opinion, depending on the same factors which govern the intensity of flavoring matter. Men and children usually prefer a striking depth of color, while many women demand a mere suggestion of the appropriate tint. Under the circumstances, it would be misleading to indicate the quantity or proportion of color to be used. That is a matter to be governed by the demands of a community and the taste of the individual Ice-Cream maker. But there must be a definite standard for the corresponding color of every fruit and flavor used. Some of the colors recommended on pages 100 and 101 are conventional, but universal custom has created the demand for them and they should not be changed without regard for the consequences.

Drop by drop: don't pour. There is a vast difference in effect between the pale tint of a lightly used color and the deep shade of the same color used heavily. Thus a very light use of caramel color produces a straw shade while a heavy use of the same color produces a chocolate brown shade and there may be a difference of only a few drops between them. Just as in flavors, some colors have the quality of coloring more intensely than others: usually the yellows and lighter greens are easily overpowered by the reds and blues. Use your colors slowly and deliberately. Where two colors are combined, use them in the relative proportion shown in the following key or table.

KEY TO CORRECT COLORS[1]

For Ice-Creams and Other Frozen Desserts

Fruit and Flavor	Corresponding Color[1]
Apple, combine	Creme de Menthe Shade Green (liquid or dry), 1 part, Navel Orange Shade (dry), 2 parts;
Apple Cider	Caramel Shade Brown (dry);
Apricot	Navel Orange Shade (liquid or dry);
Banana	Banana Shade Yellow (liquid or dry);
Blackberry	Helitrope Shade (dry);
Blueberry	Riverside Violet Shade (dry);
Cherry	Cherry Shade Red (liquid or dry);
Chocolate	Chocolate Shade Dark Brown (dry);
Coffee	True Coffee Flavoring Paste (self coloring);
Cooked, frozen products	Yolk-Em Eggs Shade (liquid or dry);
Cranberry combine	Imperial Dark Red Shade (liquid or dry), 4 parts, Riverside Violet Shade (dry), 1 part;
Creme de Menthe	Creme de Menthe Shade Green (liquid or dry);
Currant	Cardinal Dark Red Shade (liquid or dry);
Custards	Yolk-Em Egg Shade (liquid or dry);
Dewberry	Heliotrope Shade (dry);
French Ice-Creams	Yolk-Em Egg Shade (liquid or dry);
Ginger	Caramel Shade Brown (dry);
Gooseberry	Clover Leaf Shade Green (liquid or dry);
Grape, green combine	Lemon Shade Yellow (liquid or dry), 20 parts, Creme de Menthe Shade Green (liquid or dry); 1 part;
Red	Cherry Blossom Shade Pink (liquid or dry);
Purple	Pansy Shade Violet (dry);
Grapefruit	Lemon Shade Yellow (liquid or dry);
Lemon	Lemon Shade Yellow (liquid or dry);
Lime combine	Lemon Shade Yellow (liquid or dry), 15 parts, Creme de Menthe Shade Green (liquid or dry, 5 parts;
Loganberry	Heliotrope Shade, (dry);
Maple	Maple Shade Brown (dry);
Maraschino	Cherry Shade Red (liquid or dry);
Mint	Creme de Menthe Shade Green (liquid or dry);
Muskmelon	Mandarin Orange Shade (liquid or dry);
Neapolitan Ice-Creams	Yolk-Em Egg Shade (liquid or dry);
Nectarine	Navel Orange Shade (liquid or dry);

[1]The colors used are our Malaboza Pure Food Colors, in liquid form or in dry form. The key does not apply if another brand is used.

New York Ice-Creams.....Yolk-Em Egg Shade (liquid or dry);
Nuts, all except pistachio.....Yellow Liquid Color for Ice-Cream;
Orange .....Navel Orange Shade (liquid or dry);
Blood .....Blood Orange Shade (liquid or dry);
Satsuma .....Mandarin Orange Shade (liquid or dry);
Tangarine .....Mandarin Orange Shade (liquid or dry);
Peach .....Navel Orange Shade (liquid or dry);

Pear .....combine { Navel Orange Shade (liquid or dry), 5 parts, Creme de Menthe Shade Green (liquid or dry), 1 part;

Philadelphia Ice-Creams.....Yellow Liquid Color for Ice-Creams;
Pineapple .....Yellow Liquid Color for Ice-Creams;
Pistachio .....Pistachio Shade Green (liquid or dry);

Plum, green.....combine { Lemon Shade Yellow (liquid or dry), 15 parts, Creme de Menthe Shade Green (liquid or dry), 1 part;

Red .....Cherry Blossom Shade Pink (liquid or dry);
Purple .....Pansy Shade Violet (dry);
Pommegranate .....Blood Orange Shade (liquid or dry);
Prune .....Chocolate Shade Dark Brown (dry);
Raspberry .....Raspberry Shade Red (liquid or dry);

Rhubard .....combine { Creme de Menthe Shade Green (liquid or dry), 1 part, Caramel Shade Brown (dry), 20 parts;[1]

Rose .....Brilliant Rose Shade Pink (liquid or dry);
Strawberry .....Strawberry Shade Red (liquid or dry);
Vanilla Ice-Creams.....Yellow Liquid Color for Ice-Cream;
Violet .....Riverside Violet Shade (dry).

In dissolving caramel color, be sure that all particles are fully dissolved before judging a shade. Caramel does not dissolve as quickly as other colors.

SALT AS AN INGREDIENT

The use of salt in the Ice-Cream formula is a survival of the cook-book stage of the industry. Ice-Cream was then a product of the kitchen, where a handful of salt was considered necessary because of the eggs, flour, starch, and other similar items then cooked into the product. Some of the older Ice-Cream makers still use it, generally in the proportion of 0.05 per cent. of the mix.

Such a quantity is not enough to prevent the growth of lactic acid bacteria, not enough to act as a preservative, not enough to affect the taste, and may be tolerated as harmless. It is important, however, that the quantity be not increased to the point where it can be tasted and that it be completely dissolved and thoroughly mixed so as to be evenly diffused through the entire mix.

[1]Liquid and dry, used together, are measured by volume.

If salted butter were used to obtain the necessary fat it would involve the use of more than seven times the customary 0.05 per cent. of salt. For instance: it would require 12 pounds ¾ ounces salt, or more than 0.36 per cent. of the mix. This explains the necessity of using only unsalted butter when butter must be used to obtain the necessary proportion of fat: otherwise a very objectionable salty taste will be imparted to the Ice-Cream. If only salted butter is available, it must be treated in the manner described on page 48.

STANDARDIZING MILK AND CREAM

Milk and cream both vary greatly in milk-fat content. A standard Ice-Cream mix must be uniform and should always contain the same percentage of milk fat. In order to make it possible and convenient to use, in a standard formula, any available milk, cream and other milk products suitable for use in a standard Ice-Cream mix, they must be altered by raising or lowering the percentage of milk-fat in them to a fixed standard. This is done by mixing either whole or skim milk or water with cream or condensed, evaporated or powdered milk in such proportions as will produce the desired result.

A simple method has been devised of computing the quantities of two milk products to be thus combined. It can be applied to every condition requiring the standardization of these products that will arise in Ice-Cream making; but the way of using it varies slightly under different conditions. These conditions may all be considered under three heads: (1) Where a definite quantity of milk (in any form) or cream is to be standardized by the addition of a second milk product; (2) Where a definite quantity of standardized milk or cream is to be made by combining two milk products; (3) Where definite quantities of two milk products, which, when combined, will not have the required standard, are to be standardized by the addition of a third milk product.

The explanation of the method is as follows:

Draw a rectangle containing two diagonals, thus:

In the center, where the diagonals cross, put the milk-fat standard desired. At each corner on the left side put the milk-fat content of one of the two milk products to be combined. Diagonally across from each of these, in a corner on the right side of the rectangle, place the difference between it and the number in the center.

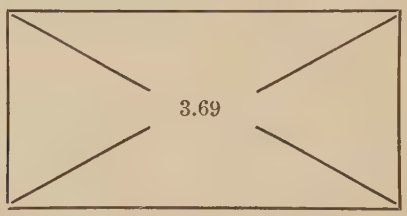
The numbers in the left corners are, of course, the standards of the products to be combined. The number directly opposite, each of these, on the horizontal line with it, is the number of pounds of that product to be used in making a mixture which is to have the fat content indicated in the center.

The sum of the numbers on the right is the number of parts, by weight, in a mixture of the desired standard, and not by gallons or quarts. The percentage of milk-fat (and of milk-solids-not-fat, as well) in milk, cream or other milk products is always calculated on the weight, never on the measured quantity.

The applications of this method to actual problems arising under each of the three possible conditions will illustrate and make it clear.

I. Where milk of a certain standard is to be made by adding whole or skim milk to a definite quantity of cream or other milk product.

Having 18 lbs. of 30 per cent. cream how much 3.25 per cent. milk must one add to it to make 3.69 per cent. milk?



Draw the rectangle with its diagonals. Place 3.69 in the center, 3.25 at one left-hand corner and 30 at the other.

$$3.69 - 3.25 = 0.44$$

Place 0.44 diagonally opposite 3.25. It is the number of parts by weight of 30 per cent. cream to be used.

$$30 - 3.69 = 26.31$$

Place 26.31 diagonally across from the 30. It is the number of parts by weight of 3.25 per cent. milk to be added.

$$0.44 + 26.31 = 26.75,$$

the parts of 3.69 per cent. milk made. Thus the proportions of milk and creams to be used will be in the ratio of 26.31 to 0.44. Having used up 0.44 part of our 18 lbs. of 30% cream in making 26.75 lbs. of 3.69 per

cent. milk, it is evident that there will be as many times this quantity of 3.69% milk as 0.44 will go into 18. Therefore:

$$18 \div 0.44 = 40.91$$
$$40.91 \times 26.31 = 1076.3421, \text{ or}$$

1076¼, the pounds of 3.25 per cent. milk required.

There will be

$$18 + 1076¼ = 1094¼ \text{ lbs.}$$

of 3.69 per cent. milk.

Prove the correctness of this result as follows:

30 per cent. of 18 is 5.40
3.25 per cent. of 1076¼ is 34.98

3.69 per cent. of 1094¼ is 40.38 lbs. of milk fat.

Always prove calculations.

Gallons are more often a convenient measure of quantity for milk and other liquids than pounds. How many gallons of milk must be added to the 18 lbs. of 30 per cent. cream to make 3.69 per cent. milk?

Calculate the number of pounds required in the manner shown.

Turn to the table on pages 38 and 39. The weight of 3.25 per cent. milk, as there shown, is 8.577 lbs. per gallon. The weight of 30 per cent. cream is 8.354 lbs. per gallon.

18÷8.354=2.16 gals. or 2 gals. 1¼ pts. of cream. 1076.3421÷8.577 =125.49 gals. or 125½ gals. of 3.25 per cent. milk. 2.16+125.49=127.65 gals. or 127 gals. 5¼ pts. of 3.69 per cent. milk.

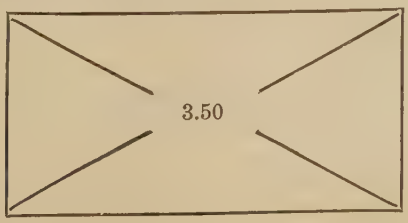
Skim milk may be used instead of whole milk. It (or water) must be used where the standard of the milk to be made is lower than the standard of the whole milk available and of the cream or other milk product being used.

Condensed whole milk or powdered whole milk or unsalted butter may be used instead of cream. Their weight per gallon will be found in the table on pages 114 and 115. They must always, when standardizing them, be added to milk by weight.

II. Where a definite quantity of standardized milk or cream is to be made.

How many pounds of 3 per cent. milk must be added to 36 per cent. cream to make 300 lbs. of 3.50 per cent. milk?

A rectangle is constructed and the numbers placed on it in the same manner as shown above:



32.50+.50=33 parts by weight of 3.50 per cent. milk, made by combining 32½ parts of 3 per cent. milk and ½ part of 36 per cent. cream.

$$300 \div 33 = 9.0909$$

9.0909 ×	32½ =	295.454 lbs.	3 per cent. milk
9.0909 ×	½ =	4.546 lbs.	36 per cent. cream
Combined,		300 lbs.	3.50 per cent. milk

If the decimals extend beyond three points, drop the excess, increasing the final figure in the decimal of the product with the larger milk-fat content by 1. This insures sufficient milk-fat in the final result.

Prove it:

295.454 ×	.03 =	8.86362	
4.546 ×	.36 =	1.63656	
300	×	= 10.50018	lbs. milk-fat

The equivalent in gallons of these pounds of milk and cream is calculated as shown in the first example.

If 30 gallons of 3.50 per cent. milk is required instead of 300 lbs., the basic quantities (32½ lbs. of 3 per cent. milk and ½ lb. of 36 per cent. cream to make 33 lbs. of 3.50 per cent. milk) are first learned as shown above.

Then, from the table on pages 38 and 39:

3 per cent. milk weighs 8.578 lbs. per gallon;
36 per cent. cream weighs 8.309 lbs. per gallon.

32.50 (lbs. 3 per cent. milk) ÷ 8.578 = 3.788, the gallons of 3 per cent. milk in 33 lbs. of mixture.

.50 (lb. 36 per cent. cream) ÷ 8.309 = 0.602 gal., the quantity, by measure, of 36 per cent. cream in 33 lbs. of mixture.

3.7888 + .0602 = 3.849 gals. 3.50 per cent. milk in 33 lbs. of mixture.

30 (gals. required) ÷ 3.849 = 7.797.

7.797 × 3.7888 =	29.54 gals.		3 per cent. milk;
7.797 × .0602 =	.47 gal.		36 per cent. cream;
	30.01 gals.		3.50 per cent. milk.

III. When definite quantities of two milk products are to be standardized by the addition of a third.

What quantity of skim milk with .05 per cent. milk-fat must be used to standardize 30 lbs. of powdered whole milk (28.20 per cent. milk-fat) and 5 gallons 18 per cent. cream to make a mix containing 4 per cent. milk-fat?

As the quantities of powdered whole milk and 18 per cent. cream to be used are known, compute their milk-fat content when mixed together, thus:

First, ascertain the weight of 5 gallons of 18 per cent. cream. Its weight per gallon (see page 38) is 8.449 lbs. Therefore,

$$8.449 \times 5 = 42.245 \text{ lbs.}$$

Now calculate milk-fat contents of the two products:

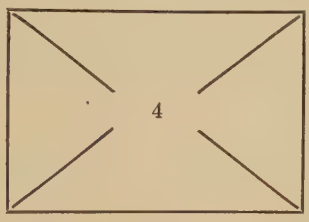
Cream, $42.245 \times .18 = 7.6041$;
P. wh.m., $30 \times .2820 = 8.46$;

72.245 lbs. mixture 16.0641 pounds of milk-fat.

$16.0641 \div 72.245 \times 100 = 22.235$,

the per cent of milk-fat in combined powdered milk and cream.

Now treating these two as one, make and mark rectangle as before:



18.235 lbs. of skim milk in
22.185 lbs. of 4 per cent milk

72.245 (weight of powdered milk and cream) $\div 3.95 = 18.29$
$18.235 \times 18.29 = 333.578$, the pounds of skim milk required.
$333.578 + 72.245 = 405.763$ lbs., the quantity of 4% milk made.

To prove it:

$333.578 \times .0005 = .167$
$72.245 \times .22235 = 16.063$

$405.763 \times .04 = 16.23$ lbs. milk fat in the standardized milk.

Any number of milks or creams or other milk products of which there is a certain quantity to be used may be mixed together and their fat content calculated in the same manner as was done with powdered whole milk and 18 per cent. cream in the above problem, and then, treating the combination as one product, it may be standardized in the manner shown above.

SIMPLE METHOD OF CALCULATING ICE-CREAM FORMULAS

This method of calculating formulas may at first seem intricate to the uninitiated, but when understood, as it should be on a first or at most a second reading, it will be found very simple, and it has the merit of being an old one that has stood the test of time, and of **always producing absolutely accurate results.**

Standardized Ice-Creams invariably contain three major ingredients, each with a distinct primary purpose: first, to supply milk fat or butter fat; second, to supply milk-solids-not-fat, also known as serum solids; third, to provide volume.

The various ingredients which perform these functions may be grouped under these three heads as follows:

I. **Fat supplying:**

Cream,
Butter,
Condensed whole milk,
Sweetened condensed whole milk,
Powdered whole milk.

II. **Milk-solids-not-fat supplying:**

Powdered skim milk,
Condensed skim milk,
Sweetened condensed skim milk.

III. **Volume providing:**

Whole milk,
Skim milk,
Water.

Every Ice-Cream formula in which the milk-fat and milk-solids-not-fat are properly balanced must contain an ingredient from each one of these three classes. Sweetening, flavor, and color are considerations entirely aside from these.

The problem of the man who is to calculate a formula is to determine just what quantity of each of these ingredients shall enter into it in order that it shall have in it the milk-fat (or butter-fat) and the milk-solids-not-fat, in connection with the necessary volume, that tested experence or science says must be in a balanced Ice-Cream mix of the standard determined on.

Perhaps the best way to show how such a calculation should be made is to calculate a formula, explaining the several operations.

Problem: Having whole milk (with 3.25% milk-fat), 30 per cent. cream and condensed skim milk, calculate a standard formula for a 10 per cent. vanilla Ice-Cream.

Calculate all formulas for a 100-lb. mix, and from it derive the quantities for 5-gallon and 100-gallon mixes and any multiple or fraction of either of them.

The ingredients entering into a 10 per cent. mix which are fixed and need not be calculated are:

Quantity (lbs.)		Sugar solids	Total solids
13.46	Granulated sugar (13.73 lbs. less 0.27 lbs. in Meloine solution)	13.40	13.40
2.333	Meloine solution	.27	.38
.375	Gelatin		.32
16.07		13.67	14.10

Therefore,

100 — 16.07=83.93 lbs., the volume required.

The milk fat required is 10 lbs. and the milk-solids-not-fat 10.06 lbs. (See table, page 17).

Condensed skim milk contains 0.14 per cent. milk fat (average; see table, page 114.

The quantity of an ingredient in the mix, multiplied by the percentage of milk fat in it, gives the quantity of milk fat it contributes to the mix, and the sum of these quantities for all ingredients containing milk fat is, of course, the total amount of milk fat in the mix. Therefore (expressing percentages decimally and indicating ingredients by their initials):

$$(.0325\times M)+(.30\times C)+(.0014\times CSM)=10.00$$

To simplify calculations, multiply these quantities by 100, number the equation, "1", and combine them thus:

(1) $3.25M+30C+.14CSM=1{,}000$

In the same manner we show how the milk-solids-not-fat in the mix are supplied. According to the table on pages 38 and 39, 3.25% milk contains 9.065 per cent. of such solids, 30% cream contains 7.40%, condensed skim milk contains 27.69% and the mix should contain 10.06% (table, page 17). Therefore (again multiplying by 100 and numbering this equation "2"):

(2) $9.065M+7.40C+27.69CSM=1{,}006$

These three ingredients together provide the required volume (83.93 lbs.), therefore:

(3) $M+C+CSM=83.93$

If this equation (3) is multiplied by 27.69 we can, by subtracting equation No. 2 from it, eliminate the condensed skim milk from that equation. Doing this, we have

(3*) $27.69M \quad 27.69C \quad 27.69CSM \quad 2{,}324.08$

Now subtract equation 2 from this thus:

$$\begin{array}{rl} (3^*) & 27.69\ M+27.69C+27.69CSM=2324.08 \\ & 9.065M+\ 7.40C+27.69CSM=1006. \\ \hline & 18.625M+20.29C \qquad\qquad =1318.08 \end{array}$$

Always subtract an ingredient from a like ingredient and subtract the equation in which the second member is the smaller from the other.

In like manner eliminate CSM from equation 1. Multiply equation 3 by .14, getting:

(3**) $.14M+.14C+.14CSM=11.75$

Subtract this from equation No. 1, thus:

$$\begin{array}{rl} (1) & 3.25M+30C \quad +14CSM=1{,}000 \\ (3^{**}) & .14M+\ 0.14C+14CSM=\ \ 11.75 \\ \hline (5) & 3.11M+29.86C \qquad =\ 988.25 \end{array}$$

Next we combine equations 4 and 5, in like manner, for the purpose of eliminating either M or C. As M has figures that are smaller multipliers than those of C, select M for elimination.

First multiply equation 4 by 3.11, getting:

(4*) $57.92M+63.10C=4{,}099.22$

Next multiply equation 5 by 18.625, getting:

(5*) $57.92M+556.14C=18{,}406.15$

Subtract equation 4* from 5*:

$$\begin{array}{rl} (5^*) & 57.92M+556.14C=18{,}406.15 \\ (4^*) & 57.92M+\ 63.10C=\ 4{,}099.22 \\ \hline & 493.04C=14{,}306.93 \end{array}$$

Now divide as follows:

$$14{,}306.93 \div 493.04=29.02$$

This is the quantity, in pounds, of cream required for the 100-lb. mix. It is sufficient to carry the decimal to 3 points.

Next substitute the value, in lbs., of C in either equation 4 or 5. Do it in 4 because it is easier to multiply by 20.29 than by 29.86.

Hence:

$$29.02 \times 20.29 = 588.78$$

and substituting,

$$18.625\ M + 588.78 = 1218.08.$$

Now subtract $558.78 = 588.78$ to eliminate the value of C, getting:

$$18.625\ M = 729.30.$$

Then

$$729.30 \div 18.625 = 39.16.$$

This is the quantity of whole milk in the mix.

Of course, deducting the milk and cream from the total volume of ingredients required, will give the third ingredient, making up that volume. Therefore:

$$83.93 - (29.02 + 39.16) = 15.76,$$

which is the quantity of condensed skim milk required.

To prove this work, calculate the percentage of milk-fat and milk-solids-not-fat in these quantities of the ingredients.

First, the milk fat:

Whole milk,	3.25%	of	39.16 =	1.27
Cream,	30%	of	29.02 =	8.71
Cond. skim milk,	0.14%	of	15.76 =	.02
			Total milk fat,	10.00

Carrying decimals to two places is usually sufficient.

Next, the milk-solids-not-fat:

Whole milk,	9.065%	of 39.16	2.15
Cream,	7.40%	of 29.02	3.55
Cond. skim milk,	27.69%	of 15.76	4.36
			10.06

How to Calculate Weight of Mix

Knowing now the quantities of all ingredients required to make the 100-lb. mix, we determine from them the quantities of each required for a 100-gallon mix.

It is necessary to learn the weight per gallon of the mix. This is given in the table on page 17, but it is well to know how to determine it.

We first calculate the volume of the solids and moisture in the mix, by dividing the weight of each kind of solid by its specific gravity, and multiplying the amount of moisture by 1.0028 (the weight of 1 gram of water at 20° C. or 68° F.) to convert weight into volume.

The solids in this mix, the specific gravity of each, and the moisture, are as follows:

Milk fat	10	lbs., spec. grav.	0.93
Milk-solids-not-fat	10.06	lbs., spec. grav.	1.616
Sugar solids,	13.67	lbs., spec. grav.	1.58
Meloine and gelatin (together class as colloids)	0.43	lb., spec. grav.	1.01
Moisture	65.84	lbs.	

We, therefore, have:

$$\frac{10}{93}=10.75$$

$$\frac{10.06}{1.616}=6.23$$

$$\frac{13.67}{1.58}=8.65$$

$$\frac{.43}{1.01}=.43$$

$$65.84\times1.0028=66.02$$

Volume of mix, 92.08

This volume into 100 will give the specific gravity of the mix. Hence:

$100\div92.08=1.086$

Water weighs 8.32162 lbs. per gallon. Therefore:

$8.32162\times1.086=9.037$,

which is the weight per gallon of the mix. The 100-gallon mix will consequently weigh 903.7 lbs.

Weight per Gallon of Mix

The quantity in gallons, etc., in the 100-lb. mix, of the ingredients—milk, cream, etc.,—which is usually measured rather than weighed, must next be calculated. This is done by dividing the number of pounds of each ingredient by its weight per gallon.

The weight per gallon of 3.25 per cent. milk is 8.5766 lbs.; of 30 per cent. cream, 8.354 lbs. (see table page 38); of condensed skim milk, 9.282 lbs. (see table, page 114). Therefore:

Whole milk	39.157÷8.5766	4.565 gals.
Cream	29.018÷8.354	3.474 gals.
Cond. skim milk	15.757÷9.282	1.698 gals.

Count any decimal beyond three points for the milk fat supplying ingredient, however small, as increasing the third figure in the decimal by one, so that there will be no danger of a deficiency of milk-fat in the

100-gallon mix and other mixes derived from it. For example, the foregoing division for cream resulted 3.47355+ and is counted 3.474, and it would have been so recorded even though instead of the final "55" we had "49."

As 4.565 gallons of whole milk is the quantity in the 100-pound mix, the quantity of whole milk in the 100-gallon mix is 9.037 times as much and the same is true of the other ingredients. Therefore we now calculate the quantities for the 100-gallon mix as follows:

Whole milk, $4.565 \times 9.037 = 41.254$ gals. or 41¼ gals.

Cream, $3.474 \times 9.037 = 31.395$ gals. or 31 gals. 3¼ pts.

Cond. skim milk, $1.698 \times 9.037 = 15.345$ gals. or 15 gals. 2¾ pts.

Sugar, $14.46 \times 9.037 = 130.675$ lbs. or 130 lbs. 11 oz.

To calculate the quantities for the 5-gallon mix, divide those for the 100-gallon mix by 20.

The quantities of Meloine solution required in the 100-lb., the 100-gallon, and the 5-gallon mixes, are shown in the table on page 70, while the quantities for gelatin will be found in the table on page 60.

They are calculated in the same manner as quantities for other ingredients.

Every kind of formula may be calculated by applying the method described in the foregoing pages, but one variation needs a few words of explanation.

If sweetened condensed skim or whole milk is used, the sugar content of that ingredient must be allowed for.

Assume that in the problem worked out above, instead of condensed skim milk we have sweetened condensed skim milk (3.15 to 1). It contains 44 per cent. sugar solids (table, page 114). The solids of sugar are 99.55 per cent. of its volume. Therefore:

$$44 \div .9955 = 45.2$$

which is the percentage of sugar added in the sweetened condensed milk.

Our first three equations will then be (since sweetened condensed skim milk, 3.15 to 1, contains 0.145% milk fat and 29.08 milk-solids-not-fat):

(1) $3.25\ M + 30\ C + .145\ SCSM = 1000$

(2) $9.065\ M + 7.40 + 29.08\ SCSM = 1006$

(3) $M + C + SCSM = 83.932 + 45.2\ SCSM$

That is, the volume to be provided has to be increased by the amount of sugar in the sweetened condensed milk, since the quantity of added sugar will be decreased by that amount.

Equation No. 3 is then simplified by deducting from it

·45.2 SCSM=45.2SCSM,

giving as a result:

(3*) M+C+54.8 SCSM=83.932.

The solution of the problem, from this point on, is worked out in exactly the same manner as that first given.

FAT CALCULATIONS FOR AVERAGE MILK

While average milk is calculated throughout on the basis of 3.69 per cent. butter fat, it is sufficient, for practical purposes, to calculate it as containing 3.7 per cent.

COMPOSITION AND WEIGHT OF ICE-CREAM INGREDIENTS

to be Used in Standardizing a Mix

(Weights given are calculated for "room temperature," which is 68 degrees F. Any difference in temperature at time of calculating may safely be ignored in practical work. The moisture content of ingredients is equal to the difference between the total solids and 100.00 per cent.)

Ice-Cream Ingredients	Butter fat or milk fat, (per cent.)	Milk solids not fat (per cent.) [1]	Added sugar solids (per cent.)	Total solids (per cent.)	Weight per gallon (pounds)
Ice Cream, mix [2]	10	10.06	13.67	34.16	9.0364
Ice Cream, frozen [2]	10	10.06	13.67	34.16	4.6751
Water					8.32162
Whole milk (average) [3]	3.69	9.04		12.73	8.572
Skim milk (average) [3]	.05	9.236		9.286	8.602
Cream [3]	18	8.08		26.08	8.449
Condensed whole milk (2.15 to 1) [4]	7.92	19.42		27.34	8.910
Condensed skim milk (3 to 1) [4]	.14	27.69		27.83	9.282
Condensed skim milk (4 to 1) [5]	.185	36.92		37.105	9.663
Condensed skim milk (5 to 1) [6]	.23	46.16		46.39	10.077
Sweet'd condensed whole milk (2.4 to 1) [4]	8.84	21.68	42	72.52	10.799
Sweet'd condensed skim milk (3.15 to 1) [4]	.145	29.08	44	73.225	11.424
Powdered whole milk (originally 3.5%)	28.20	70.30		98.50	11.047 [7]
Powdered skim milk	1.35	95.85		97.20	13.364 [7]
Cream powder (originally 18%)	71.15	28.29		99.44	
Butter (unsalted)	83	1.50		84.50	7.871 [7]

Ice-Cream Ingredients	Butter fat or milk fat, (per cent)	Milk solids not fat (per cent) [1]	Added sugar solids per cent	Total solids (per cent)	Weight per gallon (pounds)
Butter oil (molten butter, settled)	100			100	7.739
Granulated sugar (cane or beet)				99.55	13.148
Maple sugar (medium hard)				93	
Maple sugar (soft)				90	
Maple sirup				67.50	11.25
Invert sugar (sirup)				80	11.75
Honey (40° B. at 100° F.)				78.50	11.890
Corn sugar				93.50	
Refined corn sugar (colorless corn sugar)				99.60	
Corn sirup (confect's, 43° B. at 100° F.)				82.70	11.979
85% corn sirup, 15% refiners' sirup				73.40	
85% corn sirup, 15% maple sirup				73.40	
85% corn sirup, 15% cane sugar sirup				73.40	
Maltose sirup (42° B. at 100° F.)				80	11.696
Hen eggs (whole, without shell) [8]				24.50	8.581
Hen egg white				12.29	8.696
Hen egg yolk [8]				52	8.428
Powdered egg yolk [8]				95	
Meloine				96	
Mello Freeze				96	
"Snow"				96	
Gelatin				86.08	
Zanzibar-Brand American Process Cocoa				96	
Cocoa sirup for Ice-Cream mix (see page 258)	5.56	5.59	27.50	62.35	11.431
Zanzibar-Brand Imitation Maple flavor				6.	9.59
XXXX-Brand Pure Vanilla extract				2.50	8
I. C. M. Special Pure Vanilla extract				2.50	7.969
$1000 Guaranteed Pure Vanilla extract				2.50	7.938
Vanheller				2.50	8.188
Ice-Cream Maker's Friend				2.50	8.188
Ice-Cream Bouquet				2.50	8.39
Van Bouquet				1.60	8.188
Van Bouquet Concentrated				11.0	8.625
Vaniloid				13.50	8.50
Citric acid crystals					8.8515
Nuts: see table on page 98					
Malaboza Pure Food Ice-Cream Color [9]				negligible	

[1]Commonly designated, "Serum solids".

[2]For other mix percentages, see page 17.

[3]For weights and proportions of other percentages, see table on page 38. For practical purposes, the butter-fat content may safely be calculated as 3.7 per cent.

[4]Allowing a loss of 0.0125 of the per cent. of milk fat and of 0.0175 of the per cent. of solids-not-fat in condensation.

[5]Allowing a loss of 0.015 of the per cent. of milk fat and of 0.02 of the per cent. of solids-not-fat in condensation.

[6]Allowing a loss of 0.0175 of the per cent. of milk fat and of 0.0225 of the per cent. of solids-not-fat in condensation.

[7]By specific gravity, not a dry measured gallon.

[8]While hen eggs have a fat content of 0.20 per cent., and the powdered egg yolk a fat content of 55 per cent., this cannot be calculated as butter-fat or milk-fat.

[9]For Colors, see pages 100-101.

TESTING ICE-CREAM FOR BUTTER FAT

A modified Babcock method of testing plain Ice-Cream for butter fat is given by DePew and Dyer[1] in the following words:

"1. Secure a representative sample of Ice-Cream by taking several plugs from various parts of the container.

"2. Place the sample bottle containing the Ice-Cream in water at 110 degrees F. until thoroughly melted.

"3. Thoroughly mix the melted Ice-Cream.

"4. Weigh 9 grams into each of two 9-gram 50% cream test bottles which have previously been balanced on a cream test scale.

"5. Add 9 cc. of water at 140 degrees F. to each sample.

"6. Now add about 13-14 cc. of glacial acetic acid to each bottle.

"7. Shake thoroughly and allow to stand for a few minutes.

"8. Add 12 cc. of sulphuric acid (sp. gr. 1.82). Shake thoroughly and allow to stand for a few minutes.

"9. Place the bottles in the centrifuge and whirl for 5 minutes, 3 minutes, 1 minute at the maximum rate of speed allowed for the centrifuge; fill bottles with hot water to the bottom of the neck after the first whirling and to the top of the graduation after the second whirling.

"10. Place the bottles in a water bath at 140 degrees F. for 3 minutes and read with dividers, using glymol to flatten the meniscus."

To determine absolutely the milk-solids-not-fat in Ice-Cream, or even in milk, for that matter, the only accurate method is to determine the total dry matter (fat and other solids) by evaporation, and then eliminate fat, added cane sugar and other added ingredients. The table on pages 38 and 39 is sufficiently accurate for all standards in which

[1]H. F. DePew and S. W. Dyer, U. of N. H., Ext. Bull. 27.

the milk or cream has not been adulterated by the addition of water or by subtraction of fat by skimming. If the ingredients of our Ice-Cream formulas have been followed faithfully, the solids content there given should be accepted by authorities as practically correct. They represent averages, usual tolerances deducted for practical operation and conservatism.

HOW TO STANDARDIZE THE 3.69% MILK OF THE FORMULAS TO SUIT THE DIFFERENT FAT CONTENT OF OTHER MILKS

The formulas use a milk of 3.69 per cent. milk fat, which is the average for the entire country. Under each Ice-Cream standard, there is also a formula using the standard milk of the state to which the Ice-Cream standard applies. The 3.69 milk standard may be near enough for practical purposes in many cases, if not in most. But where the milk used is much leaner than 3.69 per cent., the difference may be sufficient to cause the Ice-Cream to fall below local standards. On the other hand, where the milk used is richer than 3.69 per cent., it would be wasteful to use it in the proportions given in the formulas.

Leaner milk can be raised to 3.69 per cent. milk fat content by adding cream, and richer milk may be reduced to 3.69 by diluting it with skim milk. The manner of doing either is fully explained in the chapter on "Standardizing Milk and Cream."

The following table reduces the calculations necessary to make the required adjustment. The trifling change brought about in the milk solids not fat, is in no case more than about 0.25 per cent. and may safely be ignored. The table is used as follows:

Find, in the first column, the fat test of the milk that is available. On the same line, under the heads 18, 30, 36 or 40 per cent. cream and unsalted butter for milks of 3.50 standard and less, and under skim milk for milks above that standard, will be found the proportion of that product preceded in each instance by the proportion of available milk which may be substituted for the 3.69 per cent. milk mentioned in the formulas.

For example: On page 150, the first formula of standard 10 per cent. Ice-Cream calls for 57.272 pounds of whole milk (3.69% milk fat). Assume that the manufacturer has only **3.25 per cent. milk** and wants to know how to use it **in making a 100-pound mix** according to the formula. Finding 3.25 in the first column of the following table, we follow the line to the 40 per cent. group (that being the cream then available), and find he must use:

3.25 per cent. milk	98.80%	of 57.272	or 56.58 lbs.
40 per cent. cream	1.20%	of 57.272	or .69 lbs.
Total to be replaced in 100-pound mix.....			57.27 lbs.

Or assume that the milk the manufacturer has, contains 4.50 **milk fat.** As before, finding 4.50 in the first column of the following table, he finds on the same line a single group of substitutes, and learns that he must use:

4.50 per cent. milk 81.80% of 57.272 or 46.85 lbs.
Skim milk, 18.20% of 57.272 or 10.42 lbs.

Total to be replaced in 100-pound mix.....57.27 lbs.

If calculating on the basis of 100-gallon mix, the quantities are—
3.25 per cent. milk:

60 gals. 3 pts. of 3.69% milk to be replaced =

60 gals. 3 pts. × 8.57 (weight per gal. of 3.69% milk—see page 38) = 517.53

Following the line of 3.25% milk, in the first column of the table on opposite page, to the 40% cream group, we find that 98.8% of the milk allowance must be 3.25% milk and 1.2% of it 40% cream. Therefore,

98.8% of 517.534 = 511.324 lbs. 3.25% milk.

511.324 ÷ 8,5766 (weight per gal. of 3.25% milk) = 59.62 gals. or 59 gals. 7¾ pts. 3.25% milk.

1.2% of 517.534 = 6.21 lbs. 40% cream.

6.21 ÷ 8.279 (weight per gal. of 40% cream = 0.75 gal. or 3 qts. 40% cream.

4.5 per cent. milk:

Following the line of 4.50% milk, we find that 81.8% of the milk allowance must be 4.5% milk and 18.2% of it skim milk. Therefore,

81.8% of 517.534 = 423.343 lbs. 4.5% milk.

423.343 ÷ 8.565 (approximate weight per gal. of 4.5% milk) = 49.42 gals. or 49 gals. 3½ pts. 4.5% milk.

18.2% of 517.534 = 94.191 lbs. skim milk.

94.191 ÷ 8.602 (Weight per gal. of skim milk) = 10.95 gals. or 10 gals. 7½ pts. skim milk.

If calculating on the basis of a 5-gallon mix, take 5 per cent, or one-twentieth of the quantities required for the 100-gallon mix

3.25 per cent. milk:

59.62 ÷ 20 = 2.98 gals. or 2 gals. 7¾ pts. 3.25% milk;
0.75 ÷ 20 = .0375 gal. or ¼ pt. 40% cream.

4.5 per cent. milk:

49.42 ÷ 20 = 2.47 gals. or 2 gals. 3¾ pts. 4.5% milk;
10.95 ÷ 20 = .55 gal. or 4½ pts. skim milk.

HOW TO USE MILK OF DIFFERENT STANDARD

The following formulas provide for whole milk of other than the 3.69 per cent. standard. All ingredients of the original formula, except the milk, remain unchanged.

Standard of available milk (per cent. milk fat)	Instead of the 3.69 per cent. whole milk in formula use like quantity of any one of the following combinations:									
	Available milk (parts by weight)	18 per cent. cream (parts by weight)	Available milk (parts by weight)	30 per cent. cream (parts by weight)	Available milk (parts by weight)	36 per cent. cream (parts by weight)	Available milk (parts by weight)	40 per cent. cream (parts by weight)	Available milk (parts by weight)	Unsalted butter (parts by weight)
3	95.40	4.60	97.44	2.56	97.91	2.10	98.13	1.84	99.135	0.865
3.25	97.00	3.00	98.35	1.65	98.65	1.35	98.80	1.20	99.448	0.552
3 50	98.68	1.32	99.28	0.72	99.41	0.59	99.47	0.53	99.761	0.239
		[1] Skim milk								
3.75	98.38	1.62								
4.	92.16	7.84								
4.25	86.67	13.33								
4.50	81.80	18.20								
4.75	77.45	22.55								
5.	73.54	26.46								
5.25	70	30								
5.50	66.79	33.21								
5.75	63.86	36.14								
6	61.18	38.82								

HOW TO STANDARDIZE THE CREAM OF ANY FORMULA TO SUIT THE DIFFERENT FAT CONTENT OF ANOTHER CREAM

The formulas provide for the use of only such creams as are most common in Ice-Cream circles: namely, 18, 30, 36, and 40 per cent. milk fat or butter fat and such other creams as are standard in the states for which the Ice-Cream standard is suited. But the local market may handle creams of other standards, such as 16, 20, or 22 elsewhere too.

It is a simple matter to standardize from a higher to a lower fat

[1] Water is the only other volume-giving ingredient that could be used, but its use would require the addition of some other ingredient rich in solids-not-fat (such as powdered skim milk or condensed skim milk) thus making a complicated and unsatisfactory substitution.

content if either whole milk or skim milk is available, as may be seen in the chapter on "Standardizing Milk and Cream". But it requires either a richer cream or a cream separator to raise the fat content.

The following table shows, without extensive calculation, how any other cream can be used instead of the 18, 30, 36, or 40 per cent. cream specified in the formulas.

Find, in the first column, the cream it is intended to use. On the same line, under the head of 18, 30, 36, or 40 per cent. cream, will be found the items to be substituted for the cream, and the proportion of each.

For example. On page 151, the fourth formula of standard 10 per cent. Ice-Cream calls for 29.21 pounds of 30 per cent. cream. Assume that the manufacturer has only 22 per cent. cream and wants to know how to use it in making a 100-pound mix according to that formula. Finding the 22 in the first column of the following table, we follow that line to the 30 per cent. group and find he must use—

22 per cent. cream,	86.25% of 29.21 or	25.19 lbs.;
Unsalted butter,	13.25% of 29.21 or	3.87 lbs.;
Powdered skim milk,	0.50% of 29.21 or	0.15 lbs.;
Total to be replaced in 100-pound mix,		29.21 lbs.

If calculating on the basis of a 100-gallon mix, the quantities are —

22 per cent. cream:

25.19 ÷ 8.416 lbs. (weight per gal. of 22% cream — see page 39) = 2.99 (gals. in 100-pound mix).

2.99 × 9.04 (weight per gal. of mix — see page 17) = 27.03 gals. required for 100-gallon mix = 27 gals. ¼ pt.

Unsalted butter:

3.87 × 9.04 = 34.98 lbs. = 34 lbs. 15 2-3 oz.

Powdered skim milk:

.15 × 9.04 = 1.36 lbs. = 1 lb. 5 1-3 oz.

If calculating on the basis of a 5-gallon mix, take 5 per cent. or one-twentieth of the quantities required for the 100-gallon mix

27.03 ÷ 20 = 1.35 gals. = 1 gal. 2¾ pts. 22 per cent. cream;
34.98 ÷ 20 = 1.75 lbs. = 1 lb. 12 oz. unsalted butter;
1.36 ÷ 20 = 0.07 lbs. = 1 oz. powdered skim milk.

HOW TO USE CREAM OF DIFFERENT STANDARD THAN THOSE PROVIDED FOR IN FORMULAS

All ingredients of the original formula, except the cream, remain unchanged.

Standard of the available cream (per cent. milk fat)	Instead of the 18 per cent. cream in formula use like quantity of following combination		Instead of the 30 per cent. cream in formula use like quantity of following combination			Instead of 36 per cent. cream in formula use like quantity of following combination			Instead of 40 per cent. cream in formula use like quantity in following combination		
	Available cream (parts by weight)	Unsalted butter (parts by weight)	Available cream (parts by weight)	Unsalted butter (parts by weight)	Powdered skim milk (parts by weight)	Available cream (parts by weight)	Unsalted butter (parts by weight)	Powdered skim milk (parts by weight)	Available cream (parts by weight)	Unsalted butter (parts by weight)	Powdered skim milk (parts by weight)
15	95.59	4.41	77.09	22.20	0.71	67.80	31.11	1.09	61.11	37.13	1.76
16	97.01	2.99	78.28	21.05	0.67	68.85	30.08	1.07	62.57	35.76	1.67
17	98.48	1.52	79.50	19.84	0.66	69.92	29.03	1.05	63.55	35.17	1.28
18			80.76	18.61	0.63	71.03	27.94	1.03	64.56	34.18	1.26
		Skim milk									
19	94 72	5.28	82.06	17.35	0.59	72.17	26.84	0.99	65.60	33.17	1.23
20	89.97	10.03	83.39	16.04	0.57	73.34	25.69	0.97	66.67	32.12	1.21
21	85.68	14.32	84.77	14.69	0.54	74.55	24.50	0.95	67.77	31.03	1.20
22	81.78	18.22	86.25	13.25	0.50	75.86	23.25	0.89	68.96	29.90	1.14
23	78.22	21.78	87.72	11.83	0.45	77.16	21.98	0.86	70.14	28.74	1.12
24	74.96	25.04	89.26	10.33	0.41	78.51	20.66	0.83	71.37	27.54	1.09
25	71.96	28.04	90.85	8.78	0.37	79.92	19.29	0.79	72.66	26.29	1.05
30	58.69	41.31				87.97	11.57	0.46	79.99	19.28	0.73
				Skim milk							
36	49.93	50.07	83.32	16.68					90.92	8.75	0.33
							Skim milk				
40	44.93	55.07	74 99	25 01		89 98	10 02				

Ice-Cream may be classified as:

I Standard Ice-Cream,

II Neapolitan or New York Ice-Cream,

III Vienna Ice-Cream,

IV French Ice-Cream,

V Parfaits, mousses, whips, etc.,

VI Custards, puddings, and bisquit and bomb glaces,

VII Ices and sherbets,

VIII Lactos and syllabubs.

Standard Ice-Cream, usually called in books and periodicals "Philadelphia Ice-Cream", is known to the great mass of people simply as Ice-Cream.

It is composed of cream, milk, and other milk products, sugar, gelatin or other stabilizer, flavoring, color, and, to obtain best results, Meloine or Mello-Freeze, without the addition of eggs or other similar items and without cooking. The proportions of each are governed by laws, by official regulation, and by the physical requirements of a well balanced Ice-Cream that is smooth and palatable, no matter if it is made with or without costly processing.

It is the standard or regular mix of this book — the basic Ice-Cream — and enters into nearly all the formulas for the various frozen desserts classified as Ice-Creams, except those called ices and sherbets.

The following formulas are for this standard Ice-Cream, as also are the chocolate, fruit, nut and bisque formulas which begin on page 262. They are in accord with the table of requirements on page 17 and may be considered as the best practicable formulas for the fat standard they represent.

These formulas provide for three different batches.

The first, for 100-pound mix, in which the quantities of the several ingredients are stated by weight, is intended for use in scientific determination and also for manufacturers who weigh their materials instead of measuring them.

The second, immediately following the names of ingredients, labeled "Five-gallon mix", for the use of those desiring to make a five-gallon mix or any multiple of it.

The last column states the quantities of ingredients for a 100-gallon mix, and following its directions, one may make a 100-gallon mix or any multiple or fraction of 100-gallons.

Under the head of the "100-pound mix", the composition of each ingredient and of the total ingredients is given. This enables the Ice-Cream maker to determine the source and percentage of the butter fat, the milk solids not fat, the sugar, and the total solids. It is this analysis which serves to standardize the formula in accordance with the requirements of the outline table on page 17 and in accordance with official standards.

Although other formulas in other parts of the book may not (for want of room) show such an analysis, such formulas were nevertheless so calculated.

2.40 PER CENT. MIX FOR "ICE-MILK"

40-quart freezer: size batch, 5 gals. as given in next to last column;
60-quart freezer: size batch, 7½ gals. 1½ times quantities in next to last column;
80-quart freezer: size batch, 10 gals. twice quantities in next to last column;
100-quart freezer: size batch, 12½ gals. 2½ times quantities in next to last column;
120-quart freezer; size batch, 15 gals., 3 times quantities in next to last column.

Standard at Present in California: Whole milk (3 per cent. milk fat)[1].

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)[1]	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
82.437	2.47	7.49		9.96	Whole milk (3% milk fat)[2]	4 gals., 2¾ pts.	86 gals., 7 pts.
14.73			14.66	14.66	Granulated sugar	6 lbs. 10¾ oz.	133 lbs. 3 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.5				.43	Gelatin[4]	3½ oz.	4 lbs., 8¼ oz.
.1				.10	"Snow"[4]	¾ oz.	14½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.47	7.49	14.93	25.53	Percentage totals		

Standard at Present in Washington: Whole milk (3.25 per cent. milk fat)[5].

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)[6]	Milk Solids Not Fat, (lbs.)[5]	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
82.437	2.68	7.07		9.75	Whole milk (3.25% milk fat[6])	4 gals., 2½ pts.	86 gals., 7 pts.
14.73			14.66	14.66	Granulated sugar	6 lbs., 10½ oz.	133 lbs., 3 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.5				.43	Gelatin[4]	3½ oz.	4½ lbs.
.1				.10	"Snow"[4]	¾ oz.	14½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.68	7.07	14.93	25.32	Percentage totals		

[1]To cover California where "Ice Milk" made of "the combination of pure sweet milk and sugar" is standard. Since provision is not made for adding milk solids, this formula is deficient in milk-solids-not-fat and total solids. Weight of mix per gallon, 9.041 lbs.; drawing swell, 54.26%; weight of frozen Ice Milk, 5.86 lbs. per gallon.

[2]Standard for whole milk in California.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

[4]Reduced to comply with present laws of Calif. and Wash., which limit gelatin and "Snow" to 0.6 per cent.

[5]To cover Washington where "Ice Milk" made of "the combination of pure sweet milk and sugar" is standard. Since provision is not made for adding milk solids, this formula is deficient in milk-solids-not-fat and total solids. Weight of mix per gallon, 9.039 lbs.; drawing swell, 55.13%; weight of frozen Ice Milk, 5.82 lbs. per gallon.

[6]Present standard for whole milk in Washington, 3.25 per cent. milk fat. Using this milk the Ice Milk necessarily contains milk fat in excess of the minimum requirements of 2.40 per cent.

2.40 PER CENT. MIX FOR "ICE-MILK"

Weight of mix, 9.206 lbs. per gallon;

If drawn when swell is at 80.67 per cent., weight of frozen Ice-Milk will be 5.09 lbs. per gallon.

Whole milk (3.69 per cent. milk fat) with sweetened condensed skim milk (3.15 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
65.59	2.42	5.93		8.35	Whole milk (3.69% milk fat)	3½ gals.	70 gals., 3 pts.
17.50	.03	5.09	7.70	12.82	Sweetened cond. skim milk (3.15 to 1)	5¾ pts.	14 gals., ¾ pts.
7.081		.65		.65	Skim milk	3 pts.	7 gals., 4½ pts.
6.99			6.96	6.96	Granulated sugar	3 lbs., 3½ oz.	64 lbs., 7 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.501				.43	Gelatin	3¾ oz.	4 lbs., 9½ oz.
.105				.10	"Snow"	¾ oz.	15½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.45	11.67	14.93	29.69	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
2.76	2.29	.04		2.33	Unsalted butter	1¼ lbs.	25 lbs., 6 oz.
12.12	.16	11.63		11.79	Powdered skim milk	9 oz.	11 lbs., 2 oz.
67.551					Water	3¾ gals.	74¾ gals.
14.73			14.66	14.66	Granulated sugar	6¾ lbs.	135½ lbs.
2.233			.27	.38	Meloine solution	1 pt.	2 gals., 1½ pts.
.501				.43	Gelatin	3¾ oz.	4 lbs., 9½ oz.
.105				.10	"Snow"	¾ oz.	15½ oz.
To suit					Vanilla flavoring.....	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.45	11.67	14.93	29.69	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

2.40 PER CENT. MIX for "ICE-MILK" WITH CORN SIRUP

Weight of mix, 9.24 lbs. per gallon.
Weight of frozen "Ice-Milk," 5.11 lbs. per gallon.
Cream, 18 per cent., with condensed skim milk (3 to 1 condensation) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening values (lbs.)[1]	Total Solids, (lbs.)			
13.28	2.39	1.07		3.46	Cream, 18%[2]	5¾ pts.	14½ gals.
25.28	.04	7.00		7.04	Condensed skim milk (3 to 1)	1¼ gal.	25 gals., ½ pt.
38.926	.02	3.60		3.62	Skim milk	2 gals., ¾ pt.	41 gals., 5¼ pts.
13.43			13.37	13.37	Granulated sugar	6 lbs., 3 oz.	124 lbs., 2 oz.
6.46			1.29	5.34	Corn sirup	2 pts.	4 gals., 7¾ pts.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	3 oz.	3 lbs., 9¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.45	11.67	14.93	33.55	Percentage totals		

2.40 PER CENT. MIX for "ICE-MILK" WITH CORN SUGAR

Weight of mix, 9.35 lbs. per gallon.
Weight of frozen "Ice-Milk," 5.18 lbs. per gallon.
Whole milk (3.69 per cent. milk fat), with condensed skim milk (3 to 1 condensation) and cream, 30 per cent., added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening values (lbs.)[1]	Total Solids, (lbs.)			
52.336	1.93	4.73		6.66	Whole milk (3.69% milk fat)	2 gals., 6½ pts.	56 gals., 1¾ pts.
24.63	.03	6.82		6.85	Condensed skim milk (3 to 1)	1 gal., 1¾ pt.	24 gals., 3½ pts.
1.62	.49	.12		.61	Cream 30%	¾ pt.	1 gal., 6½ pts.
9.71			9.67	9.67	Granulated sugar	4 lbs., 8½ oz.	90 lbs., 13 oz.
9.08			4.99	9.04	Refined corn sugar	4 lbs., 3¾ oz.	84 lbs., 14 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	3 oz.	3 lbs., 10½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	2.45	11.67	14.93	33.55	Percentage totals		

[1]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.
[2]California law requires that 18 per cent. cream shall contain not more than 8 per cent. milk solids not fat. The use of such a cream would cause a trivial reduction in the total solids—less than .02 per cent. in this formula.
[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

3.50 PER CENT. MIX for "MILK ICE"

Standard in Tennessee[1]

Weight of mix, 9.177 lbs. per gallon.
If drawn when swell is at 82.50 per cent., weight of frozen Milk-Ice will be 5.03 lbs. per gallon.

40-quart freezer: mix batch, 5 gals., as given in next to last column.
60-quart freezer: size of batch, 7½ gals., 1½ times quantities in next to last column.
80-quart freezer: size batch, 10 gals., twice quantities in next to last column.
100-quart freezer: size batch, 12½ gals., 2½ times quantities in next to last column.
120-quart freezer: size batch, 15 gals., 3 times quantities in next to last column.

Whole milk (3.50 per cent. milk fat) with condensed skim milk (3 to 1 concentration) and cream, 18 per cent., added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
51.32	1.80	4.65		6.45	Whole milk (3.50% milk fat)[2],	2¾ gals.	54 gals., 7½ pts.
21.751	.03	6.02		6.05	Condensed skim milk (3 to 1)	1 gal., ½ pt.	21½ gals.
9.58	1.72	.77		2.49	Cream, 18 per cent	4¼ pts.	10 gals., 3¼ pts.
14.56			14.49	14.49	Granulated sugar	6 lbs., 11 oz.	133 lbs., 10 oz.
2.233			.27	.38	Meloine Solution[3]	1 pt.	2 gals., 1½ pts.
0.482				.42	Gelatin	3½ oz.	4 lbs., 6¾ oz.
0.074				.07	"Snow"	½ oz.	10¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	3.55	11.44	14.76	30.35	Percentage totals		

Unsalted butter with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat. (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
4.27	3.54	.06		3.60	Unsalted butter	1 lb., 15½ oz.	39 lbs., 3 oz.
11.871	.01	11.38		11.39	Powdered skim milk	5 lbs., 7 oz.	108 lbs., 15 oz.
66.51					Water	3 gals., 5¼ pts.	73¼ gals.
14.56			14.49	14.49	Granulated sugar	6 lbs., 11 oz.	133 lbs., 10 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
0.482				.42	Gelatin	3½ oz.	4 lbs., 6¾ oz.
0.074				.07	"Snow"	½ oz.	10¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	3.55	11.44	14.76	30.35	Percentage totals		

[1]With the present milk standard of Tenn., the standard provided for Milk-Ice is possible only with the addition of other butter fat and serum solids. Since an addition must be made, it was thought best to give it body enough for proper swell and resistance.

[2]Standard for whole milk in Tenn.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

4 PER CENT. MIX for ICE-CREAM

Weight of mix, 9.168 lbs. per gallon.
If drawn when swell is at 83.33 per cent., weight of frozen Ice-Cream will be 5 lbs. per gallon.

40-quart freezer; size batch, 5 gals., as given in next to last column.
60-quart freezer; size batch, 7½ gals., 1½ times quantities in next to last column.
80-quart freezer; size batch, 10 gals., twice quantities in next to last column.
100-quart freezer; size batch, 12½ gals., 2½ times quantities in next to last column.
120-quart freezer; size batch, 15 gals., 3 times quantities in next to last column.

Whole milk (3.69 per cent milk fat), with condensed skim milk (3 to 1 condensation) and cream, 30 per cent., added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
54.898	2.03	4.96		6.99	Whole milk (3.69% milk fat)	2 gals., 7½ pts.	58 gals., 4¾ pts.
21.22	.03	5.88		5.91	Condensed skim milk (3 to 1)	1 gal., ½ pt.	20 gals., 7¾ pts.
6.65	1.99	.49		2.48	Cream, 30%	3 pts.	7 gals., 2½ pts.
14.46			14.40	14.40	Granulated sugar	6 lbs., 10 oz.	132 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts
.474				.41	Gelatin	3½ oz.	4 lbs., 6 oz.
.065				.06	"Snow"	½ oz.	9½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	30.63	Percentage totals		

Whole milk (3.69 per cent. milk fat), with powdered skim milk and unsalted butter added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
76.818	2.84	6.94		9.78	Whole milk (3.69% milk fat)	4 gals., 1 pt.	82 gals., 1¼ pts.
4.56	.06	4.37		4.43	Powdered skim milk	2 lbs., 1½ oz.	41 lbs., 13 oz.
1.39	1.15	.02		1.17	Unsalted butter	10¼ oz.	12¾ lbs.
14.46			14.40	14.40	Granulated sugar	6 lbs., 10 oz.	132 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.474				.41	Gelatin	3½ oz.	4 lbs., 6 oz.
.065				.06	"Snow"	½ oz.	9½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	30.63	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

4 PER CENT. MIX for ICE-CREAM

Condensed whole milk (2.15 to 1 concentration) with cream, 36 per cent., skim milk and powdered skim milk added.

190 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
19.43	1.54	3.77		5.31	Condensed whole milk (2.15 to 1)	1 gal.	20 gals.
6.808	2.45	.49		2.94	Cream, 36%	3 pts.	7½ gals.
54.39	.03	5.02		5.05	Skim milk	2 gals., 7¼ pts.	57 gals., 7½ pts.
2.14	.03	2.05		2.08	Powdered skim milk	14½ oz.	19 lbs., 10 oz.
14.46			14.40	14.40	Granulated sugar	6 lbs., 10 oz.	132 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.474				.41	Gelatin	3½ oz.	4 lbs., 6 oz.
.065				.06	"Snow"	½ oz.	9½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	30.63	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
4.68	3.89	.07		3.96	Unsalted butter	2 lbs., 2 oz.	42 lbs., 15 oz.
11.75	.16	11.26		11.42	Powdered skim milk	5 lbs., 6 oz.	107¾ lbs.
66.338					Water	3 gals , 5¼ pts.	73¾ gals.
14.46			14.40	14.40	Granulated sugar	6 lbs., 10 oz.	132 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.474				.41	Gelatin	3½ oz.	4 lbs., 6 oz.
.065				.06	"Snow"	½ oz.	9½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	30.63	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

4 PER CENT. MIX for ICE-CREAM WITH CORN SIRUP

Weight of mix, 9.19 lbs. per gallon.

Weight of frozen Ice-Cream, 5.01 lbs. per gallon.

Sweetened condensed whole milk (2.4 to 1 concentration) with cream, 40 per cent., and skim milk.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
25.34	2.24	5.49	10.60	18.33	Sweetened cond. whole milk (2.4 to 1)	1 gal., ½ pt.	21 gals., 3½ pts
4.45	1.78	.31		2.09	Cream, 40%	2 pts.	4 gals., 7½ pts.
59.886	.03	5.53		5.56	Skim milk	3 gals., 3¼ pts.	63 gals., 6½ pts.
2.84			2.83	2.83	Granulated sugar	1 lb., 5 oz.	26 lbs., ½ oz.
4.86			.97	4.02	Corn sirup	1½ pts.	3 gals., 4¾ pts.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	3 oz.	3 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	33.55	Percentage totals		

4 PER CENT. MIX for ICE-CREAM WITH CORN SUGAR

Weight of mix, 9.27 lbs. per gallon.

Weight of frozen Ice-Cream, 5.01 lbs. per gallon.

Whole milk (3.69 per cent. milk fat) with cream, 18 per cent. and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
43.716	1.61	3.95		5.56	Whole milk (3.69% milk fat)	2 gals., 2¾ pts.	46 gals., 6¼ pts.
13.38	2.41	1.08		3.49	Cream, 18%	6 pts.	14 gals., 3½ pts.
22.75	.03	6.30		6.33	Condensed skim milk (3 to 1)	1 gal., 1 pt.	22 gals., 3¾ pts.
10.69			10.64	10.64	Granulated sugar	4 lbs., 15¼ oz.	99 lbs., 1 oz.
6.84			3.76	6.81	Refined corn sugar	3 lbs., 1¼ oz.	63 lbs., 7 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin.	3 oz.	3 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	4.05	11.33	14.67	33.55	Percentage totals		

[1]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

5 PER CENT. MIX for ICE-CREAM

Weight of mix, 9.143 lbs. per gallon.
If drawn when swell is at 85 per cent., weight of frozen Ice-Cream will be 4.94 lbs. per gallon.

40-quart freezer: size batch, 5 gals., as given in next to last column.
60-quart freezer: size batch, 7½ gals., 1½ times quantities in next to last column.
80-quart freezer: size batch, 10 gals., twice quantities in next to last column.
100-quart freezer: size batch, 12½ gals., 2½ times quantities in next to last column.
120-quart freezer: size batch, 15 gals., 3 times quantities in next to last column.

Whole milk (3.69 per cent. milk fat), with condensed skim milk (3 to 1 condensation) and cream, 30 per cent., added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
52.332	1.93	4.73		6.66	Whole milk (3.69% milk fat)	2 gals., 6¼ pts.	55 gals., 6½ pts.
20.33	.03	5.63		5.66	Condensed skim milk (3 to 1)	1 gal.	20 gals. ¼ pt.
10.31	3.09	.76		3.85	Cream, 30%	4½ pts.	11 gals., 2¼ pts
14.29			14.23	14.23	Granulated sugar	6½ lbs.,	130 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.458				.39	Gelatin	3¼ oz.	4 lbs., 3 oz.
.047				.04	"Snow"	⅜ oz.	6¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	5.05	11.12	14.50	31.21	Percentage totals		

Whole milk (3.69 per cent. milk fat), with sweetened condensed skim milk (3.15 to 1 concentration) and cream, 36 per cent. added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
67.122	2.48	6.07		8.55	Whole milk (3.69% milk fat)	3 gals., 4¾ pts.	71 gals., 4¾ pts.
15.66	.02	4.55	6.86	11.43	Sweetened cond. skim milk (3.15 to 1)	5¼ pts.	13¼ gals.
7.08	2.55	.50		3.05	Cream, 36%	3¼ pts.	7 gals., 6½ pts.
7.40			7.37	7.37	Granulated sugar	3 lbs., 6¼ oz.	67 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts
.458				.39	Gelatin	¼ oz.	4 lbs., 3 oz.
.047				.04	"Snow"	⅜ oz.	6¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	5.05	11.12	14.50	31.21	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve accuracy of the formula, but it can be added at once.

5 PER CENT. MIX for ICE-CREAM

Cream 18 per cent., with sweetened condensed whole milk (2.4 to 1 condensation) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
16.87	3.04	1.36		4.40	Cream, 18%	7½ pts.	18¼ gals.
22.39	1.98	4.85	9.36	16.19	Sweetened cond. whole milk (2.4 to 1)	7¼ pts.	18 gals., 7¾ pts.
53.112	.03	4.91		4.94	Skim milk	2 gals., 6½ pts.	56 gals., 3½ pts.
4.89			4.87	4.87	Granulated sugar	2 lbs., 3¾ oz.	44¾ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.458				.39	Gelatin	3¼ oz.	4 lbs., 3 oz.
.047				.04	"Snow"	⅜ oz.	6¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	5.05	11.12	41.50	31.21	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
5.89	4.89	.09		4.98	Unsalted butter	2 lbs., 9 oz.	53 lbs., 14 oz.
11.51	.16	11.03		11.19	Powdered skim milk	5¼ lbs.	105 lbs., 2 oz.....
65.572					Water	3 gals., 4¾ pts.	72 gals., ½ pt.
14.29			14.23	14.23	Granulated sugar	6½ lbs.	130 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.458				.39	Gelatin	3¼ oz.	4 lbs., 3 oz.
.047				.04	"Snow"	⅜ oz.	6¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	5.05	11.12	14.50	31.21	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

5 PER CENT. MIX for ICE-CREAM WITH CORN SIRUP

Weight of mix, 9.16 lbs. per gallon.
Weight of frozen Ice-Cream, 5.02 lbs. per gallon.
Cream, 40 per cent., with skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values[1] (lbs.)	Total Solids, (lbs.)			
12.40	4.96	.86		5.82	Cream, 40%	5½ pts.	13¾ gals.
62.946	.03	5.81		5.84	Skim milk	3 gals., 3 pts.	66 gals., 7¼ pts.
4 64	.06	4.45		4.51	Powdered skim milk	2 lbs., 2¼ oz.	42 lbs., 6 oz.
13.52			13.46	13.46	Granulated sugar	6 lbs., 3 oz.	123 lbs., 13 oz.
3.87			.77	3.20	Corn sirup	1¼ pts.	2 gals., 7¾ pts.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 9¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Maltoza Pure Food Color	To suit	To suit
100.	5.05	11.12	14.50	33.55	Percentage totals		

5 PER CENT. MIX for ICE-CREAM WITH CORN SUGAR

Weight of mix, 9.23 lbs. per gallon.
Weight of frozen Ice-Cream, 5.06 lbs. per gallon.
Whole milk, (3.69 per cent. milk fat) with unsalted butter and condensed skim milk (3 to 1 condensation) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values[1] (lbs.)	Total Solids, (lbs.)			
55.026	2.03	4.97		7.00	Whole milk (3.69% milk fat)	2 gals., 7¼ pts.	58 gals., 5½ pts.
3.60	2.99	.05		3.04	Unsalted butter	1 lb., 10½ oz.	32 lbs., 15oz.
22.02	.03	6.10		6.13	Condensed skim milk (3 to 1)	1 gal., ¾ pt.	21 gals., 5¼ pts.
11.28			11.23	11.23	Granulated sugar	5 lbs., 2½ oz.	103 lbs., 2 oz.
5.45			3.00	5.43	Refined corn sugar	2 lbs., 8¼ oz.	50 lbs., 5 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 9½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
1.00	5.05	11.12	14.50	33.55	Percentage totals		

[1]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

6 PER CENT. MIX for ICE-CREAM

Weight of mix, 9.123 lbs. per gallon.
If drawn when swell is at 86.67 per cent., weight of frozen Ice-Cream will be 4.88 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column.
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column.
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column.
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column.
120-qt. freezer, 15 gals., 3 times quantities in next to last column.

Whole milk (3.69 per cent. milk fat), with cream (30 per cent.) and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
67.311	2.48	6.08		8.56	Whole milk (3.69% milk fat)	3 gals., 4¾ pts.	71 gals., 5¼ pts.
11.79	3.52	.87		4.39	Cream, 30%	5¼ pts.	12 gals., 5½ pts.
4.13	.06	3.96		4.02	Powdered skim milk	1 lb., 14¼ oz.	37 lbs., 11 oz.
14.13			14.06	14.06	Granulated sugar	6 lbs., 7 oz.	128 lbs., 14 oz.
2.233			.27	.38	Meloine solution [1]	1 pt.	2 gals., 1½ pts.
.442				.38	Gelatin	3¼ oz.	4 lbs., ½ oz.
.034				.03	"Snow"	¼ oz.	5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6.06	10.91	14.33	31.82	Percentage totals		

Whole milk (3.69 per cent. milk fat) with cream, 40 per cent. and sweetened condensed skim milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
65.811	2.43	5.95		8.38	Whole milk (3.69% milk fat)	3½ gals.	70 gals., ¼ pt.
9.03	3.61	.63		4.24	Cream, 40%	4 pts.	9 gals., 7½ pts.
14.88	.02	4.33	6.52	10.87	Sweetened cond. skim milk (3.15 to 1)	4¾ pts.	11 gals., 7¼ pts.
7.57			7.54	7.54	Granulated sugar	3 lbs., 6½ oz.	68 lbs., 1 oz.
2.233			.27	.38	Meloine solution [1]	1 pt.	2 gals., 1½ pts.
.442				.38	Gelatin	3¼ oz.	4 lbs., ½ oz.
.034				.03	"Snow"	¼ oz.	5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6.06	10.91	14.33	31.82	Percentage totals		

[1] If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar in order to preserve the accuracy of the formula, but it can be added at once.

6 PER CENT. MIX for ICE-CREAM

Cream, 18 per cent., with condensed skim milk (3 to 1 concentration) and skim milk.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
33.44	6.02	2.70		8.72	Cream, 18%	1 gal., 6½ pts.	36 gals., 1 pt.
19.60	.03	5.43		5.46	Condensed skim milk (3 to 1)	7¾ pts.	19¼ gals.
30.121	.01	2.78		2.79	Skim milk	1 gal., 4¾ pts.	21 gals., 7½ pts.
14.13			14.06	14.06	Granulated sugar	6 lbs., 7 oz.	128 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts
.442				.38	Gelatin	3¼ oz.	4 lbs., ½ oz.
.034				.03	"Snow"	¼ oz.	5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6.06	10.91	14.33	31.82	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
7.12	5.91	.12		6.03	Unsalted butter	3½ lbs.	64 lbs., 15 oz.
11.261	.15	10.79		10.94	Powdered skim milk	5 lbs., 2¼ oz.	102¾ lbs.
64.78					Water	3 gals., 4½ pts.	71 gals.
14.13			14.06	14.06	Granulated sugar	6 lbs., 7 oz.	128 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.442				.38	Gelatin	3¼ oz.	4 lbs., ½ oz.
.034				.03	"Snow"	¼ oz.	5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6.06	10.91	14.33	31.82	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula. but it can be added at once.

6 PER CENT. MIX for ICE-CREAM WITH CORN SIRUP

Weight of mix, 9.14 lbs. per gallon.
Weight of frozen Ice-Cream, 4.94 lbs. per gallon.

Condensed whole milk (2.15 to 1 concentration), with unsalted butter, skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
19.53	1.54	3.79		5.33	Condensed whole milk (2.15 to 1)	1 gal.	20 gals.
5.395	4.48	.81		5.29	Unsalted butter	2 lbs., 7½ oz.	49 lbs., ¼ oz.
57.40	.03	5.30		5.33	Skim milk	3 gals., ¼ pt.	60 gals., 6¼ pts.
1.05	.01	1.01		1.02	Powdered skim milk	7¾ oz.	9 lbs., 10 oz.
13.54			13.48	13.48	Granulated sugar	6 lbs., 1¼ oz.	121½ lbs.
2.89			.58	2.39	Corn sirup	1 pt.	2¼ gals.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 9¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6 06	10.91	14 33	33.56	Percentage totals		

6 PER CENT. MIX for ICE-CREAM WITH CORN SUGAR

Weight of mix, 9.18 lbs. per gallon.
Weight of frozen Ice-Cream, 4.96 lbs. per gallon.

Cream, 30 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
14.38	4.31	1.06		5.37	Cream, 30%	6¼ pts.	15 gals., 5½ pts
46.736	1.72	4.22		5.94	Whole milk (3.69% milk fat)	2½ gals.	49¾ gals.
20.32	.03	5.63		5.66	Condensed skim milk (3 to 1)	1 gal.	19 gals., 7¼ pts.
11.88			11.83	11.83	Granulated sugar	5 lbs., 6¾ oz.	108 lbs., 7 oz.
4.06			2.23	4.04	Refined corn sugar	1 lb., 13¾ oz.	27¼ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2 oz.	3 lbs., 9 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	6.06	10.91	14.33	33.56	Percentage totals		

[1]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

7 PER CENT. MIX for ICE-CREAM

Standard in Massachusetts

Weight of mix, 9.101 lbs. per gallon.
If drawn when swell is at 88.33 per cent., weight of frozen Ice-Cream will be 4.83 per gallon.
40-qt. freezer: size batch, 5 gals., as given in next to last column.
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column.
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column.
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column.
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column.

Cream, 15 per cent., with skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
46.67	7.00	3.87		10.87	Cream, 15%[1]	2½ gals.	50 gals., 1 pt.
32.745	.02	3.02		3.04	Skim milk	1¾ gals.	34 gals., 5¼ pts.
3.96	.05	3.80		3.85	Powered skim milk	1 lb., 13 oz.	36 lbs., 1 oz.
13.95			13.90	13.90	Granulated sugar	6 lbs., 6 oz.	126 lbs., 15 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.425				.37	Gelatin	3 oz.	3 lbs., 13¾ oz.
.017				.02	"Snow"	⅛ oz.	2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	32.43	Percentage totals		

Cream, 30 per cent., with whole milk (3.35 per cent. milk fat)[3] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
18.27	5.48	1.35		6.83	Cream, 30%	1 gal.	19 gals., 7¼ pts.
46.655	1.56	4.23		5.79	Whole milk (3.35% milk fat)[3]	2 gals., 3¾ pts.	49 gals., 4¼ pts.
18.45	.03	5.11		5.14	Condensed skim milk (3 to 1)	7¼ pts.	18 gals., 1 pt.
13.95			13.90	13.90	Granulated sugar	6 lbs. 6 oz.	126 lbs., 15 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.425				.37	Gelatin	3 oz.	3 lbs., 13¾ oz.
.017				.02	"Snow"	⅛ oz.	2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	32.43	Percentage totals		

[1]To cover Massachusetts, where 15 per cent. cream is standard.
[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.
[3]Massachusetts standard for whole milk.

7 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with sweetened condensed whole milk (2.4 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
14.59	5.25	1.04		6.29	Cream, 36%	6½ pts.	15 gals., 7¾ pts.
20.21	1.79	4.38	8.44	14.61	Sweetened cond. whole milk (2.4 to 1)	6¾ pts.	17 gals., ¼ pts.
57.045	.03	5.27		5.30	Skim milk	3 gals., ¼ pt.	60 gals., 2¾ pts.
5.48			5.46	5.46	Granulated sugar	2½ lbs.	49 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.425				.37	Gelatin	3 oz.	3 lbs., 13¾ oz.
.017				.02	"Snow"	⅛ oz.	2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	32.43	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
8.34	6.92	.13		7.05	Unsalted butter	3 lbs., 13 oz.	75 lbs., 14 oz.
11.02	.15	10.56		10.71	Powdered skim milk	5 lbs.	100 lbs., 5 oz.
64.015					Water	3½ gals.	70 gals., 1½ pts.
13.95			13.90	13.90	Granulated sugar	6 lbs., 6 oz.	126 lbs., 15 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.425				.37	Gelatin	3 oz.	3 lbs., 13¾ oz.
.017				.02	"Snow"	⅛ oz.	2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	32.43	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

7 PER CENT. MIX for ICE-CREAM WITH CORN SIRUP

Weight of mix.....9.10 lbs. per gallon;
Weight of frozen Ice-Cream.....4.83 lbs. per gallon.

Cream, 40 per cent., with whole milk (3.35 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
13.48	5.39	.93		6.32	Cream, 40%	6 pts.	14 gals., 6½ pts.
49.316	1.65	4.47		6.12	Whole milk (3.35% milk fat[3])	2 gals., 5 pts.	52 gals., 2¾ pts.
19.10	.03	5.29		5.32	Condensed skim milk (3 to 1)	7½ pts.	19 gals.
13.58			13.52	13.52	Granulated sugar	6 lbs., 3 oz.	123 lbs., 10 oz.
1.90			.38	1.57	Corn sirup	½ pt.	1 gal., 3½ pts.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 9 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	33.57	Percentage totals		

7 PER CENT. MIX for ICE-CREAM WITH CORN SUGAR

Weight of mix.....9.14 lbs. per gallon;
Weight of frozen Ice-Cream.....4.85 lbs. per gallon.

Whole milk (3.69 per cent. milk fat) with sweetened condensed skim milk (3.15 to 1 concentration) and unsalted butter.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values (lbs.)[1]	Total Solids, (lbs.)			
68.206	2.52	6.17		8.69	Whole milk (3.69% milk fat)	3 gals., 5 pts.	72 gals., 3¼ pts.
15.27	.02	4.44	6.69	11.15	Sweetened cond. skim milk(3.15 to 1)	5 pts.	12 gals., 1¼ pts.
5.46	4.53	.08		4.61	Unsalted butter	2½ lbs.	49 lbs., 11 oz.
5.77			5.74	5.74	Granulated sugar	2 lbs., 10 oz.	52½ lbs.
2.67			1.47	2.66	Refined corn sugar	1 lb., 3½ oz.	25 lbs., 6 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	3 oz.	3 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	7.07	10.69	14.17	33.57	Percentage totals		

[1]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

[3]Massachusettts standard for whole milk.

8 PER CENT. MIX for ICE-CREAM

Standard in Ala., Ark., Conn., Ga., Ill., Ind., Miss., Mo., N. C., N. J.,[1] N. Y., O., Pa., R. I., Tenn., Tex.,[2] Va.,[3] Wash., W. Va.

Weight of mix.....9.08 lbs. per gallon;

If drawn when swell is at 90 per cent., weight of frozen Ice-Cream will be 4.78 lbs. per gallon.

40 qt. Freezer: size batch, 5 gals., as given in next to last column;
60-qt. Freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. Freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. Freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. Freezer: size batch, 15 gals., 3 times quantities in next to last column.

Whole milk (3.69 per cent. milk fat), with sweetened condensed skim milk (3.15 to 1 concentration) and cream, 30 per cent., added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
56.038	2.07	5.07		7.14	Whole milk (3.69% milk fat)	2 gals., 7¾ pts.	59 gals., 2¾ pts.
13.51	.02	3.93	5.92	9.87	Sweetened cond. skim milk (3.15 to 1)	4¼ pts.	10¾ gals.
19.96	5.99	1.48		7.47	Cream, 30%	1 gal., ¾ pt.	21 gals., 5½ pts.
7.85			7.81	7.81	Granulated sugar	3½ lbs.	70 lbs., 1 oz.
2.233			.27	.38	Meloine solution[4]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

Whole milk (3 per cent. milk fat)[5] with powdered whole milk and unsalted butter added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
72.918	2.19	6.62		8.81	Whole milk (3% milk fat)[5]	3 gals., 6¾ pts.	77 gals., 1½ pts.
5.38	1.52	3.78		5.30	Powdered whole milk	2 lbs., 7 oz.	48 lbs., 13 oz.
5.27	4.37	.08		4 45	Unsalted butter	2 lbs., 6½ oz.	47 lbs., 13 oz.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[4]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

[1]In New Jersey, a permit is required to ship into the state.
[2]In Texas, reduce the gelatin and Meloine to 2-5 the quantities given in the formula.
[3]In Virginia, omit formulas, 3, 4, 7 and 9.
[4]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.
[5]Standard for whole milk in Ill., Miss., N. J., N. Y., and W. Va.

8 PER CENT. MIX for ICE-CREAM

Skim milk, with Cream, 36 per cent., and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
43.728	.02	4.04		4.06	Skim milk	2 gals., 2½ pts.	46 gals., 1¼ pts.
22.33	8.04	1.59		9.63	Cream, 36%	1 gal., 2¼ pts.	24 gals., 3 pts.
17.51	.02	4.85		4.87	Condensed skim milk (3 to 1)	7 pts.	17 gals., 1 pt.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

Skim milk with cream, 40 per cent., and sweetened condensed whole milk (2.4 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
56.578	.03	5.23		5.26	Skim milk	2 gals., 7¾ pts.	59 gals., 7¾ pts.
15.90	6.36	1.10		7.46	Cream, 40%	7 pts.	17 gals. 2¼ pts.
19.11	1.69	4.15	7.99	13 83	Sweetened cond. whole milk (2.4 to 1)	6½ pts.	16 gals., ½ pt.
5.77			5.74	5.74	Granulated sugar	2 lbs., 9 oz.	52 lbs., 7 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ pts.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

8 PER CENT. MIX for ICE-CREAM

Cream, 16 per cent.,[1] with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
50.13	8.02	4.12		12.14	Cream, 16%[1]	2 gals., 5½ pts.	53¾ gals.
3.78	.05	3.62		3.67	Powdered skim milk	1 lb., 11½ oz.	34 lbs., 5 oz.
29.658	.01	2.74		2.75	Skim milk	1 gal., 4½ pts.	31 gals., 2½ pts.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

Cream, 18 per cent.,[3] with whole milk (3 per cent. milk fat[4]) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
40.568	7.30	3.28		10.58	Cream, 18%[3]	2 gals., 1½ pts.	43 gals., 4¾ pts.
25.32	.76	2.30		3.06	Whole milk (3% milk fat)[4]	1 gal., 2¾ pts.	26 gals., 6½ pts.
17.68	.02	4.90		4.92	Condensed skim milk (3 to 1)	7 pts.	17 gals., 2½ pts.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

[1]To cover Connecticut and New Jersey, where 16 per cent. Cream is standard.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

[3]Standard for cream in Ala., Ark., Ga., Ill., Miss., Mo., N. Y., O., Va., and W. Va.

[4]Standard for whole milk in Ill., Miss., N. J., N. Y., and W. Va.

8 PER CENT. MIX for ICE-CREAM

Cream, 18 per cent., with condensed whole milk (2.15 to 1 concentration), skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.128	6.50	2.92		9.42	Cream, 18%	1 gal., 7½ pts.	38 gals., 6½ pts
19.62	1.55	3.81		5.36	Condensed whole milk (2.15 to 1)	1 gal.	20 gals.
26.45	.01	2.44		2.45	Skim milk	1 gal., 3¼ pts.	27 gals., 7½ pts.
1.37	.02	1.31		1.33	Powdered skim milk	9 oz.	12 lbs., 7 oz.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
9.56	7.93	.14		8.07	Unsalted butter	4 lbs., 5 oz.	96 lbs., 13 oz.
10.79	.15	10.34		10.49	Powdered skim milk	4 lbs., 14 oz.	98 lbs.
62.701					Water	3 gals., 3½ pts.	69 gals.
13.79			13.73	13.73	Granulated sugar	6 lbs., 6 oz.	127 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.409				.35	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.02	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

8 PER CENT. MIX for ICE-CREAM WITH CORN SIRUP

Weight of mix .....9.08 lbs.
Weight of frozen Ice-Cream .....4.79 lbs. per gallon.

Cream, 30 per cent., with whole milk (3.25 per cent. milk fat)[1] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values[2] (lbs.)	Total Solids, (lbs.)			
22.20	6.66	1.64		8.30	Cream, 30%	1 gal., 1¾ pts.	24 gals., 1 pt.
42.706	1.39	3.87		5.26	Whole milk (3.25% milk fat)[1]	2¼ gals.	45 gals., 1½ pts.
17.95	.03	4.97		5.00	Condensed skim milk (3 to 1)	7¼ pts.	17 gals., 4½ pts.
13.61			13.55	13.55	Granulated sugar	6 lbs., 2 oz.	123 lbs., 5 oz.
.91			.18	.75	Corn Sirup	¼ pt.	6 pts.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	3 oz.	3 lbs., 11½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.58	Percentage totals.		

8 PER CENT. MIX for ICE-CREAM WITH CORN SUGAR

Weight of mix.....9.10 lbs. per gallon;
Weight of frozen Ice-Cream.....4.78 lbs. per gallon.

Cream, 36 per cent., with skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sweetening Values[2] (lbs.)	Total Solids, (lbs.)			
22.22	8.00	1.58		9.58	Cream, 36%	1 gal., 1¾ pts.	24 gals., 3 pts.
56.986	.03	5.26		5.29	Skim milk	3 gals.	60 gals., 1¼ pts.
3.80	.05	3.64		3.69	Powdered skim milk	1 lb., 11½ oz.	34½ lbs.
13.09			13.03	13.03	Granulated sugar	5 lbs., 15 oz.	118 lbs., 14 oz.
1.28			.70	1.27	Refined corn sugar	9¼ oz.	11 lbs., 10 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 9 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	8.08	10.48	14.00	33.58	Percentage totals		

[1]Standard for whole milk in Ala., Conn., Ind., Mo., Ohio and R. I.

[2]This column includes the sweetening equivalent of corn sirup and corn sugar in terms of granulated cane sugar.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

9 PER CENT. MIX for ICE-CREAM

Weight of mix..... 9.058 lbs. per gallon;
If drawn when swell is at 91.67 per cent., weight of frozen Ice-Cream will be 4.72 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7¼ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Whole milk (3.69 per cent. milk fat), with Cream, 30 per cent., and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
57.106	2.11	5.16		7.27	Whole milk (3.69% milk fat)	3 gals.	60 gals., 2¾ pts.
23.10	6.93	1.71		8.64	Cream, 30%	1¼ gals.	25 gals., ½ pt.
3.55	.05	3.40		3.45	Powdered skim milk	1 lb., 9 oz.	32 lbs., 3 oz.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

Whole milk (3.69 per cent., milk fat), with Cream, 36 per cent., and sweetened condensed skim milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
57.276	2.11	5.18		7.29	Whole milk (3.69% milk fat)	3 gals., ¼ pt.	60 gals., 4¼ pts.
19.33	6.96	1.38		8.34	Cream, 36%	1 gal., ½ pt.	21 gals., ½ pt.
12 76	02	3.71	5.59	9.32	Sweetened cond. skim milk (3.15 to 1)	4 pts.	10 gals., 1 pt.
8.01			7.97	7.97	Granulated sugar	3 lbs., 9 oz.	71¾ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

9 PER CENT. MIX for ICE-CREAM

Whole milk (3.69 per cent. milk fat), with cream, 40 per cent. and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
49.096	1.81	4.44		6.25	Whole milk (3.69% milk fat)	2 gals., 4¾ pts.	51 gals., 7 pts.
18.15	7.26	1.26		8.52	Cream, 40%	1 gal.	19 gals., 3½ pts.
16.51	.02	4.57		4.59	Condensed skim milk (3 to 1)	6½ pts.	16 gals., 1 pt.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

Whole milk (3.69 per cent. butter fat), with unsalted butter and condensed skim milk (3 to 1 condensation) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
57.546	2.12	5.20		7.32	Whole milk (3.69% milk fat)	3 gals., ¼ pt.	60 gals., 6½ pts.
8.37	6.95	.13		7.08	Unsalted butter	3 lbs., 12¾ oz.	75 lbs., 13 oz.
17.84	.02	4.94		4.96	Condensed skim milk (3 to 1)	7 pts.	17 gals., 3½ pts.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

9 PER CENT. MIX for ICE-CREAM

Cream, 18 per cent., with powdered whole milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
50.16	9.03	4.05		13.08	Cream, 18%	2 gals., 5½ pts.	53¾ gals.
3.61	.05	3.45		3.50	Powdered whole milk	1 lb., 10¼ oz.	32 lbs., 11 oz.
29.986	.01	2.77		2.78	Skim milk	1 gal., 4¾ pts.	31 gals., 4½ pts.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

Cream, 18 per cent., with condensed whole milk (2.15 to 1 concentration), skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
41.666	7.50	3.37		10.87	Cream, 18%	2¼ gals.,	44 gals., 5½ pts.
19.67	1.56	3.82		5.38	Condensed whole milk (2.15 to 1)	1 gal.	20 gals.
21.25	.01	1.96		1.97	Skim milk	1 gal., 1 pt.	22 gals., 3 pts.
1.17	.02	1.12		1.14	Powdered skim milk	8½ oz.	10 lbs., 10 oz.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

9 PER CENT. MIX for ICE-CREAM

Cream, 30 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
30.15	9.05	2.23		11.28	Cream, 30%	1 gal., 5 pts.	32¾ gals.
16.72	.02	4.63		4.65	Condensed skim milk (3 to 1)	6½ pts.	16 gals., 2½ pts.
36.876	.02	3.41		3.43	Skim milk	1 gal., 7½ pts.	38 gals., 6¾ pts.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

Cream, 36 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
25.14	9.05	1.79		10.84	Cream, 36%	1 gal., 3 pts.	27 gals., 3¼ pts.
16.62	.02	4.60		4.62	Condensed skim milk (3 to 1)	6½ pts.	16 gals., 1 pt.
41.996	.02	3.88		3.90	Skim milk	2 gals., 1¾ pts.	44 gals., 1¾ pts.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

9 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with sweetened condensed whole milk (2.4 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
18.63	7.45	1.29		8.74	Cream, 40%	1 gal., ¼ pt.	20 gals., 3 pts.
18.17	1.61	3.94	7.60	13.15	Sweetneed cond. whole milk (2.4 to 1)	6 pts.	15¼ gals.
54.586	.03	5.04		5.07	Skim milk	2 gals., 7 pts.	57½ gals.
5.99			5.96	5.96	Granulated sugar	2 lbs., 11½ oz.	54¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

Unsalted butter with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
10.78	8.95	.16		9.11	Unsalted butter	4 lbs., 14 oz.	97 lbs., 9 oz.
10.55	.14	10.11		10.25	Powdered skim milk	4¾ lbs.	95½ lbs.
62.426					Water	3 gals., 3¼ pts.	67 gals., 7½ pts.
13.62			13.56	13.56	Granulated sugar	6 lbs., 3 oz.	123¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.391				.34	Gelatin	2¾ oz.	3 lbs., 8½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	9.09	10.27	13.83	33.64	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar in order to preserve the accuracy of the formula, but it can be added at once.

10 PER CENT. MIX for ICE-CREAM

Standard in Ariz., Calif., Colo., Kans., Ky., La., Md., Mont., Ore., Wyo.
Weight of mix..... 9.037 lbs. per gallon;

If drawn when swell is at 93.33 per cent., weight of frozen Ice-Cream will be 4.68 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Whole milk (3.69 per cent. butter fat), with cream, 40 per cent., and sweetened condensed skim milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
57.272	2.11	5.18		7.29	Whole milk (3.69% milk fat)	3 gals., ¼ pt.	60 gals., 3 pts.
19.93	7.97	1.38		9.35	Cream, 40%	1 gal., ¾ pt.	21¾ gals.
12.02	.02	3.50		8.79	Sweetened cond. skim milk (3.15 to 1)	3¾ pts.	9½ gals.
8.17			5.27	8.13	Granulated sugar	3 lbs., 11 oz.	73 lbs., 13 oz.
2.233			8.13	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.375			.27	.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

Cream, 18 per cent., with skim milk and sweetened condensed whole milk (2.4 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
47.52	8.55	3.84		12.39	Cream, 18%[1]	2 gals., 4½ pts.	50 gals., 6½ pts.
26.272	.01	2.43		2.44	Skim milk	1 gal., 3 pts.	27 gals., 4¾ pts.
17.47	1.54	3.79	7.30	12.63	Sweetened cond. whole milk (2.4 to 1)	6 pts.	14 gals., 5 pts.
6.13			6.10	6.10	Granulated sugar	2 lbs., 12¼ oz.	55 lbs., 6 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

[1]California law requires that 18 per cent. cream shall contain not more than 8 per cent. milk solids not fat. The use of such a cream would cause a trivial reduction in the total solids, less than 0.04 per cent. in this formula.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

10 PER CENT. MIX for STANDARD ICE-CREAM

Cream, 18 per cent.,[1] with whole milk (3 per cent. butter fat)[2] and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
50.892	9.16	4.11		13.27	Cream, 18%[1]	2 gals., 5¾ pts.	54 gals., 3½ pts.
29.64	.89	2.69		3.58	Whole milk (3% milk fat)[2]	1 gal., 4½ pts.	31 gals., 1¾ pts.
3.40	.05	3.26		3.31	Powdered skim milk	1 lb., 8¾ oz.	30¾ lbs.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

ream, 30 per cent., with powdered whole milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
29.21	8.76	2.16		10.92	Cream, 30%	1 gal., 4¾ pts.	31 gals., 4¾ pts.
4.66	1.31	3.28		4.59	Powdered whole milk	2 lbs., 1½ oz.	42 lbs., 2 oz.
50.062	.03	4.62		4.65	Skim milk	2 gals., 5 pts.	52 gals., 4¾ pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

[1]California law requires that 18 per cent. cream shall contain not more than 8 per cent. milk solids not fat. The use of such a cream would cause a trivial reduction in the total solids—less than 0.04 per cent. in this formula.

[2]Standard for whole milk in California and Wyoming.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

10 PER CENT. MIX for ICE-CREAM

Cream, 30 per cent., with whole milk (3.25 per cent. milk fat[1]) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
29.40	8.82	2.18		11.00	Cream, 30%	1 gal., 4¾ pts.	31 gals., 6½ pts.
38.742	1.26	3.51		3.77	Whole milk (3.25% milk fat)[1]	2 gals., ¼ pts.	40 gals., 6½ pts.
15.79	.02	4.37		4.39	Condensed skim milk (3 to 1)	6¼ pts.	15 gals., 3 pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

Cream, 36 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
27.94	10.06	1.99		12.05	Cream, 36%	1½ gals.,	30 gals., 1¾ pts.
15.70	.02	4.35		4.37	Condensed skim milk (3 to 1)	6¼ pts.	15 gals., 2¼ pts.
40.292	.02	3.72		3.74	Skim milk	2 gals., 1 pt.	42 gals., 2½ pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

[1]Standard for whole milk in Arizona and Kansas. The Oregon standard is 3.20 per cent.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

10 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3 per cent. milk fat)[1] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
24.342	8.76	1.74		10.50	Cream, 36%	1 gal., 2½ pts.	26 gals., 3¾ pts.
44.	1.32	4.00		5.32	Whole milk (3% milk fat)[1]	2 gals., 2½ pts.	46 gals., 2¾ pts
15.59	.02	4.32		4.34	Condensed skim milk (3 to 1)	..6 pts.	15 gals., 1¼ pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	3 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

Cream, 40 per cent., with whole milk (3.25 per cent. milk fat)[2] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
21.38	8.55	1.48		10.03	Cream, 40%	1 gal., 1½ pts.	23 gals., 2½ pts.
46.942	1.53	4.26		5.79	Whole milk (3.25% milk fat)[2]	2 gals., 3¾ pts.	49 gals., 3½ pts
15.61	.02	4.32		4.34	Condensed skim milk (3 to 1)	6 pts.	15 gals., 1½ pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

[1]Standard for whole milk in California and Wyoming.

[2]Standard for whole milk in Arizona and Kansas. The Oregon standard is 3.20 per cent.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

10 PER CENT. MIX for ICE-CREAM

Unsalted butter, with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
12.10	10.04	.18		10.22	Unsalted butter	5 lbs., 7 oz.	109 lbs., 5 oz.
54.262	.03	5.01		5.04	Skim milk	2 gals., 7½ pts.	57 gals.
17.58	.03	4.87		4.90	Condensed skim milk (3 to 1)	7 pts.	17 gals., 1 pt.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
12.00	9.96	.18		10.14	Unsalted butter	5 lbs., 7 oz.	108½ lbs.
10.305	.14	9.88		10.02	Powdered skim milk	4 lbs., 9 oz.	93 lbs., 3 oz.
61.627					Water	3 gals., 2¾ pts.	66 gals., 7¼ pts.
13.46			13.40	13.40	Granulated sugar	6 lbs., 1 oz.	121 lbs., 11 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.375				.32	Gelatin	2¾ oz.	3 lbs., 6¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	10.10	10.06	13.67	34.26	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

11 PER CENT. MIX for ICE-CREAM

Weight of mix..... 9.016 lbs. per gallon;

If drawn when swell is at 95 per cent., weight of frozen Ice-Cream will be 4.63 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Whole milk (3.69 per cent. milk fat), with cream, 36 per cent., and sweetened condensed milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
52.388	1.93	4.74		6.67	Whole milk (3.69% milk fat)	2¾ gals.	55 gals., ¾ pt.
25.40	9.15	1.81		10.96	Cream, 36%	1 gal., 3 pts.	27 gals., 4½ pts.
11.30	.02	3.29	4.95	8.26	Sweetened cond. skim milk (3.15 to 1)	3½ pts.	8 gals., 7¼ pts.
8.32			8.28	8.28	Granulated sugar	3¾ lbs.	75 lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

Whole milk (3.69 per cent. milk fat), with unsalted butter and condensed skim milk (3 to 1 concentration).

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
56.908	2.10	5.14		7.24	Whole milk (3.69% milk fat)	3 gals.	59 gals., 6¾ pts.
10.82	9.98	.16		9.14	Unsalted butter	4 lbs., 14 oz.	97 lbs., 9 oz.
16.39	.02	4.54		4.56	Condensed skim milk (3 to 1)	6½ pts.	15 gals., 7½ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

11 PER CENT. MIX for ICE-CREAM

Cream, 18 per cent., with whole milk (3.69 per cent. milk fat) and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
56.44	10.16	4.56		14.72	Cream, 18%	3 gals.	60 gals., 1¾ pts.
24.478	.90	2.21		3.11	Whole milk (3.69% milk fat)	1 gal., 2½ pts.	25¾ gals.
3.20	.04	3.07		3.11	Powdered skim milk	1 lb., 7 oz.	28 lbs., 14 oz.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

Cream, 18 per cent., with condensed whole milk (2.15 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
50.23	9.04	4.06		13.10	Cream, 18%	2 gals., 5½ pts.	53 gals., 4¾ pts.
26.06	2.06	5.06		7.12	Condensed whole milk (2.15 to 1)	1 gal., 2½ pts.	26 gals., 3 pts.
7.828		.72		.72	Skim milk	3¼ pts.	8 gals., 1½ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

11 PER CENT. MIX for ICE-CREAM

Cream, 30 per cent., with powdered whole milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
32.81	9.84	2.43		12.27	Cream, 30%	1 gal., 6¼ pts.	35 gals., 3¼ pts.
4.38	1.24	3.08		4.32	Powdered whole milk	2 lbs.	39½ lbs.
46.928	.02	4.33		4.35	Skim milk	2 gals., 3¾ pts.	49 gals., 1½ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

Cream, 30 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.87	11.06	2.73		13.79	Cream, 30%	1 gal., 5 pts.	39 gals., 6½ pts.
14.89	.02	4.12		4.14	Condensed skim milk (3 to 1)	5¾ pts.	14 gals., 3¾ pts.
32.358	.02	2.99		3.01	Skim milk	1 gal., 5½ pts.	33 gals., 7¼ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

11 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
26.37	9.49	1.88		11.37	Cream, 36%	1 gal., 3½ pts.	28 gals., 5 pts.
43.058	1.59	3.89		5.48	Whole milk (3.69% milk fat)	2¼ gals.	45 gals., 2¼ pts.
14.69	.02	4.07		4.09	Condensed skim milk (3 to 1)	5¾ pts.	14 gals., 2¼ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

Cream, 40 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
27.64	11.06	1.92		12.98	Cream, 40%	1½ gals.	30 gals., 1 pt.
41.828	.02	3.86		3.88	Skim milk	2 gals., 1¾ pts.	43 gals., 6¾ pts.
14.65	.02	4.06		4.08	Condensed skim milk (3 to 1)	5¾ pts.	14 gals., 1¾ pts.
13.29			13.23	13.23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

11 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with sweetened condensed whole milk (2.4 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
24.16	9.66	1.68		11.34	Cream, 40%	1 gal., 2½ pts.	26 gals., 2¼ pts.
15.92	1.41	3.45	6.98	11.84	Sweetened cond. whole milk (2.4 to 1)	5¼ pts.	13 gals., 2½ pts.
51.048	.03	4.71		4.74	Skim milk	2 gals., 5½ pts.	53½ gals.
6.28			6.25	6.25	Granulated sugar	2 lbs., 14 oz.	57¾ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
13.21	10.96	.02		11.16	Unsalted butter	5 lbs., 15 oz.	119 lbs., 2 oz.
10.06	.14	9.64		9.78	Powdered skim milk	4 lbs., 9 oz.	90¾ lbs.
60.848					Water	3 gals., 2½ pts.	65 gals., 7¼ pts.
13.29			13.23	13 23	Granulated sugar	6 lbs.	119 lbs., 14 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.359				.31	Gelatin	2½ oz.	3 lbs., 3¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	11.10	9.84	13.50	34.86	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

12 PER CENT. MIX for ICE-CREAM

Standard in Ia., Mich., Minn., N. Dak.,[1] and Wis.

Weight of mix..... 8.995 lbs. per gallon;

If drawn when swell is at 96.67 per cent., weight of frozen Ice-Cream will be 4.57 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Cream, 16 per cent., with powdered skim milk and whole milk (3. per cent. milk fat) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
74.01	11.84	6.08		17.92	Cream, 16%[2]	3 gals., 7½ pts.	78 gals., 5 pts.
2.965	.04	2.84		2.88	Powdered skim milk	1 lb., 5½ oz.	26 lbs., 11 oz.
7.33	.22	.67		.89	Whole milk (3% milk fat)[2]	3¼ pts.	7 gals., 5½ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.59	13.33	35.42	Percentage totals		

Cream, 18 per cent., with sweetened condensed whole milk (2.4 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
59.56	10.72	4.81		15.53	Cream, 18%	3 gals., 1½ pts.	63 gals., 3¼ pts.
15.48	1.37	3.36	6.47	11.20	Sweetened cond. whole milk (2.4 to 1)	5¼ pts.	12 gals., 7¼ pts.
15.765	.01	1.46		1.47	Skim milk	6½ pts.	15 gals., 7¾ pts.
6.62			6.59	6.59	Granulated sugar	2 lbs., 15 oz.	58 lbs., 3 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

[1]The standard for cream in North Dakota is 15 per cent. A 12 per cent. Ice-Cream cannot be made of it without the addition of unsalted butter or a higher per cent. cream.

[2]To cover Iowa where 16 per cent. cream and 3 per cent. whole milk are standard. The formula is 0.04 below standard in milk-solids-not-fat (as fixed in table on page 17). It is the only one of the standard formulas that is thus deficient. Powdered skim milk or powdered whole milk is the only ingredient that can be combined with 16 per cent. cream and 3 per cent. whole milk to make a 12 per cent. formula that would even approximately come up to the standard.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

12 PER CENT. MIX for ICE-CREAM

Cream, 20 per cent., with whole milk (3.25 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
58.52	11.70	4.64		16.34	Cream, 20%[1]	3 gals., 1 pt.	62 gals., 3¼ pts
11.555	.38	1.05		1.43	Whole milk (3.25% milk fat)[1]	5 pts.	12 gals., ½ pt.
14.23	.02	3.94		3.96	Cond. skim milk (3 to 1)	5½ pts.	13 gals., 6¼ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

Cream, 30 per cent., with whole milk (3 per cent. milk fat)[3] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.93	11.08	2.73		13.81	Cream, 30%	2 gals.,	39¾ gals.
33.435	1.00	3.04		4.04	Whole milk (3% milk fat)[3]	1¾ gals.	34 gals., 6¾ pts.
13.94	.02	3.86		3.88	Condensed skim milk (3 to 1)	5½ pts.	13½ gals.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

[1]To cover Minnesota, where 20 per cent. cream and 3.25 per cent. milk are standard.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

[3]Standard for whole milk in Iowa, Michigan and Wisconsin.

12 PER CENT. MIX for ICE-CREAM

Cream, 30 per cent., with powdered whole milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.40	10.92	2.69		13.61	Cream, 30%	1 gal., 7¾ pts.	39 gals., 1½ pts.
4.12	1.16	2.90		4.06	Powdered whole milk	1 lb., 13¾ oz.	37 lbs., 1 oz.
43.785	.02	4.04		4.06	Skim milk	2 gals., 2¼ pts.	45 gals., 6¼ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

Cream, 36 per cent., with whole milk (3.25 per cent. milk fat)[2] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
29.89	10.76	2.13		12.89	Cream, 36%	1 gal., 5½ pts.	32 gals., 3 pts.
40.652	1.32	3.68		5.00	Whole milk (3.25% milk fat)[2]	2 gals., 1 pt.	42 gals., 4¾ pts.
13.79	.02	3.82		3.84	Condensed skim milk (3 to 1)	5½ pts.	13 gals., 2¾ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

[2]Standard of whole milk in Minn. and N. Dak.

12 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
33.50	12.06	2.39		14.45	Cream, 36%	1 gal., 6½ pts.	36 gals., 2¼ pts.
13.805	.02	3.82		3.84	Condensed skim milk (3 to 1)	5¼ pts.	13 gals., 3 pts.
37.00	.02	3.42		3.44	Skim milk	1 gal., 7½ pts.	38 gals., 5½ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

Cream, 40 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
30.15	12.06	2.09		14.15	Cream, 40%	1 gal., 5 pts.	32¾ gals.
40.405	.02	3.73		3.75	Skim milk	2 gals., 1 pt.	42½ gals.
13.75	.02	3.81		3.83	Condensed skim milk (3 to 1)	5¼ pts.	13 gals., 2½ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula.

12 PER CENT. MIX for ICE-CREAM

Unsalted butter, with whole milk (3.25 per cent. milk fat[1]) and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
11.825	9.81	.17		9.98	Unsalted butter	5 lbs., 5 oz.	106 lbs., 6 oz.
69.17	2.25	6.29		8.54	Whole milk (3.25% milk fat)[1]	3 gals., 5 pts.	72 gals., 4½ pts.
3.31	.04	3.17		3.21	Powdered skim milk	1 lb., 7¾ oz.	29 lbs., 13 oz.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
14.42	11.97	.22		12.19	Unsalted butter	6½ lbs.	129 lbs., 10 oz.
9.82	.13	9.41		9.54	Powdered skim milk	4 lbs., 7 oz.	88¼ lbs.
60.065					Water	3¼ gals.	64 gals., 7¼ pts.
13.12			13.06	13.06	Granulated sugar	5 lbs., 15 oz.	118½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.342				.29	Gelatin	2½ oz.	3 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	12.10	9.63	13.33	35.46	Percentage totals		

[1]Standard of whole milk in Minn. and N. Dak.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

13 PER CENT. MIX for ICE-CREAM

Weight of mix..... 8.974 lbs. per gallon;

If drawn when swell is at 98.33 per cent., weight of frozen Ice-Cream will be 4.52 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Cream, 18 per cent., with powdered whole milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
66.60	11.99	5.38		17.27	Cream, 18%	3 gals., 4¼ pts.	70¾ gals.
3.91	1.10	2.75		3.85	Powdered whole milk	1¾ lbs.	35 lbs., 1 oz.
13.971	.01	1.29		1.30	Skim milk	5¾ pts.	14 gals., 4½ pts.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

Cream, 18 per cent., with whole milk (3.69 per cent. milk fat) and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
70.20	12.64	5.67		18.31	Cream, 18%	3 gals., 5¾ pts.	74 gals., 4½ pts.
11.451	.42	1.04		1.46	Whole milk (3.69% milk fat)	4¾ pts.	12 gals.
2.83	.04	2.71		2.75	Powdered skim milk	1 lb., 4½ oz.	25 lbs., 7 oz.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

13 PER CENT. MIX for ICE-CREAM

Cream, 30 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
39.71	11.91	2.94		14.85	Cream, 30%	2 gals., 1 pt.	42 gals., 5¼ pts.
31.731	1.17	2.87		4.04	Whole milk (3.69% milk fat)	1 gal., 5½ pts.	33 gals., 1¾ pts.
13.04	.02	3.61		3.63	Condensed skim milk (3 to 1)	5 pts.	12 gals., 4¾ pts.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

Cream, 30 per cent., with whole milk (3.69 per cent. milk fat) and powdered whole milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
34.38	10.31	2.54		12.85	Cream, 30%	1 gal., 6¾ pts.	36 gals., 7 pts.
46.261	1.71	4.18		5.89	Whole milk (3.69% milk fat)	2 gals., 3¼ pts.	48 gals., 3½ pts
3.84	1.08	2.70		3.78	Powdered whole milk	1 lb., 11½ oz.	34½ lbs.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

13 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.28	13.06	2.59		15.65	Cream, 36%	1 gal., 7¼ pts.	39 gals., 1 pt.
12.88	.02	3.57		3.59	Condensed skim milk (3 to 1)	5 pts.	12 gals., 3½ pts.
35.321	.02	3.26		3.28	Skim milk	1 gal., 6¾ pts.	36 gals., 6¾ pts.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

Cream, 36 per cent., with sweetened condensed whole milk (2.4 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
32.87	11.83	2.34		14.17	Cream, 36%	1 gal., 6¼ pts.	35½ gals.
14.14	1.25	3.07	5.91	10.23	Sweetened cond. whole milk (3.4 to 1)	4¾ pts.	11¾ gals.
43.411	.02	4.01		4.03	Skim milk	2 gals., 2¼ pts.	45 gals., 2¼ pts.
7.02			6.99	6.99	Granulated sugar	3 lbs., 1 oz.	61 lbs., 14 oz.
2.233				.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

13 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
32.65	13.06	2.27		15.33	Cream, 40%	1 gal., 6¼ pts.	35 gals., 3 pts.
39.021	.02	3.60		3.62	Skim milk	2 gals., ¼ pt.	40 gals., 5½ pts.
12.81	.02	3.55		3.57	Condensed skim milk (3 to 1)	5 pts.	12 gals., 3 pts.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

Cream, 40 per cent., with condensed whole milk (2.15 to 1 concentration) skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
28.78	11.51	2.00		13.51	Cream, 40%	1 gal., 4½ pts.	31 gals., 1¼ pts.
19.85	1.57	3.85		5.42	Condensed whole milk (2.15 to 1)	1 gal.	20 gals.
35.551	.02	3.28		3.30	Skim milk	1 gal., 7 pts.	37 gals., ¾ pt.
.30		.29		.29	Powdered skim milk	2¼ oz.	2 lbs., 11 oz.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

13 PER CENT. MIX for ICE-CREAM

Unsalted butter, with whole milk (3.69 per cent. milk fat) and sweetened condensed skim milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
12.86	10.67	.19		10.86	Unsalted butter	5¾ lbs.	115 lbs. ¾ oz.
65.191	2.41	5.89		8.30	Whole Milk (3.69 % milk fat)	3 gals., 3¼ pts	68¼ gals.
11.47	.02	3.34	5.02	8.38	Sweetened cond. skim milk (3.15 to 1)	3½ pts.	9 gals.
7.92			7.88	7.88	Granulated sugar	3½ lbs.	69 lbs. 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs. 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
15.624	12.97	.23		13.20	Unsalted butter	7 lbs.	140 lbs., 2 oz.
9.59	.13	9.19		9.32	Powdered skim milk	4 lbs., 5 oz.	86 lbs.
59.267					Water	3 gals., 1½ pts.	63 gals. 7¼ pts.
12.96			12.90	12.90	Granulated sugar	5 lbs., 13 oz.	116¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.326				.28	Gelatin	2¼ oz.	2 lbs., 14¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	13.10	9.42	13.17	36.08	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

14 PER CENT. MIX for ICE-CREAM

Standard in Alaska, Canal Zone, Fla., Guam, Hawaii, Idaho, Me., Neb., Nev., N. H.,[1] Okla., Phil. Isl'ds., Porto Rico, S. Dak., Utah., Vt., and under Federal laws.

Weight of mix..... 8.953 lbs. per gallon;

If drawn when swell is at 100 per cent., weight of frozen Ice-Cream will be 4.48 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Cream, 18 per cent.,[3] with sweetened condensed skim milk (3.15 to 1 concentration) and whole milk (3.69 per cent. milk fat)[2] added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
78.02	14.04	6.30		20.34	Cream, 18%[3]	4 gals., 1¼ pts.	82 gals., 5½ pts.
9.58	.01	2.79	4.20	7.00	Sweetened cond.skim milk (3.15 to 1)	3 pts.	7½ gals.
1.288	.05	.12		.17	Whole milk (3.69% milk fat)[2]	½ pt.	1 gal., 2¾ pts.
8.57			8.53	8.53	Granulated sugar	3 lbs., 13 oz.	75 lbs., 14 oz.
2.233			.27	.38	Meloine solution[4]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin[1]	2 oz.	2 lbs., 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

Cream, 18 per cent.,[3] with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
78.34	14.10	6.33		20.43	Cream, 18% [3]	4 gals., 1¼ pts.	83 gals.
2.65		2.54		2.54	Powdered skim milk	1 lb., 3 oz.	23¾ lbs.
3.678		.34		.34	Skim milk	1½ pts	3 gals., 6½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[4]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin[1]	2 oz.	2 lbs., 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

[1]In New Hampshire, reduce gelatin in 100 pound mix to 0.2 pounds or 0.2 per cent. (3 oz.); in the 40-qt. freezer mix, to 1¼ oz.; and in the 100-gallon mix, to 1 lb. 12½ oz. The quantity must then be made up in quality of the gelatin.

[2]If whole milk with 3 per cent. milk fat is used instead of 3.69 per cent. milk, the mix will contain 14.033 per cent. milk fat, covering Hawaii, with 3% standard; Idaho and Utah, with 3.20% standard; Ariz., Fla., Me., and S. Dak., with 3.25% standard, and N. H. with 3.35% standard—will necessarily all be safely above 14%.

[3]Lowest standard of cream that can be used to make 14 per cent. mix: covers Alaska, Canal Zone, Fla., Guam, Hawaii, Idaho, Me., N. H., Phillipine Islands, Porto Rico, and S. Dak. where 18 per cent. cream is standard, and also Federal laws.

[4]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

14 PER CENT. MIX for ICE-CREAM

Cream, 22 per cent.,[1] with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
63.99	14.08	5.00		19.08	Cream, 22% [1]	3 gals., 3¼ pts.	68 gals., ½ pt.
12.45	.02	3.45		3.47	Condensed skim milk (3 to 1)	4 ¾ pts.	12 gals.
8.228		.76		.76	Skim milk	3½ pts.	8 gals., 4½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs. 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

Cream, 30 per cent., with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
46.80	14.04	3.46		17.50	Cream, 30%	2 gals., 2¼ pts.	50 gals., 1¼ pts.
2.60	.04	2.49		2.53	Powdered skim milk	1 lb., 2¼ oz.	23 lbs., 5 oz.
35.268	.02	3.26		3.28	Skim milk	1 gal., 6¾ pts.	36 gals., 5½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 12 ¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

[1]Covering Nevada where 22 per cent. cream is standard.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

14 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3.20 per cent. milk fat)[1] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
35.83	12.90	2.55		15.45	Cream, 36%	1 gal., 7½ pts.	38 gals., 4¾ pts.
36.858	1.18	3.34		4.52	Whole Milk (3.20% milk fat)[1]	1 gal., 7½ pts.	38 gals., 3¾ pts.
11.98	.02	3.32		3.34	Condensed skim milk (3 to 1)	4¾ pts.	11 gals. 4½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

Cream, 36 per cent., with skim milk and sweetened condensed skim milk (3.15 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
39.09	14.07	2.79		16.86	Cream, 36%	2 gals., ¾ pts.	42 gals., 1 pt.
40.408	.02	3.73		3.75	Skim milk	2 gals., ¾ pts.	42 gals., ½ pt.
9.24	01	2.69	4.05	6.75	Sweetened cond. skim milk (3.15 to 1)	3 pts.	7¼ gals.
8.72			8.68	8.68	Granulated sugar	3 lbs., 14 oz.	77¼ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs. 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

[1]Standard of whole milk in Idaho and Utah.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

14 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with whole milk (3.25 per cent. milk fat)[1] and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
31.88	12.75	2.21		14.96	Cream, 40%	1 gal. 5¾ pts.	34 gals., 3½ pts.
40.918	1.33	3.71		5.04	Whole milk (3.25% milk fat[1]	2 gals., 1 pt....	42 gals. 4¾ pts.
11.87	.02	3.29		3.31	Condensed skim milk (3 to 1)	4½ pts.	11 gals. 3½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 12¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

Cream, 40 per cent., with skim milk and powdered skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
35.13	14.05	2.44		16.49	Cream, 40%	1 gal., 7¼ pts.	37 gals. 7½ pts.
46.998	.02	4.34		4.36	Skim milk	2 gals., 3¾ pts.	49 gals.
2.54	.03	2.43		2 46	Powdered skim milk	1 lb., 2¼ oz.	22¾ lbs.
12.79			12 73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 14¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

[1]Standard for whole milk in Fla., Me., and S. Dak. Covers also New Hampshire, where the standard for whole milk is 3.35 per cent. milk fat.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

14 PER CENT. MIX for ICE-CREAM

Unsalted butter, with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
16.93	14.05	.25		14.30	Unsalted butter	7 lbs., 9 oz.	151½ lbs.
53.088	.03	4.90		4.93	Skim milk	2¾ gals.	55¼ gals.
14.65	.02	4.06		4.08	Condensed skim milk (3 to 1)	5 ¾pts.	14 gals., 1 pt.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 14¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
16.83	13.97	.25		14.22	Unsalted butter	7 lbs., 9 oz.	150 lbs., 10 oz.
9.35	.13	8.96		9.09	Powdered skim milk	4 lbs., 3 oz.	83 lbs., 11 oz.
58.488					Water	3 gals., 1¼ pts.	62 gals., 7½ pts.
12.79			12.73	12.73	Granulated sugar	5¾ lbs.	114½ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.309				.26	Gelatin	2 oz.	2 lbs., 14¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	14.10	9.21	13.00	36.68	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

15 PER CENT. MIX for ICE-CREAM

Weight of mix..... 8.933 lbs. per gallon

If drawn when swell is at 101.67 per cent.,[1] weight of frozen Ice-Cream will be 4.43 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column.

Cream, 19 per cent.[2] with powdered skim milk and whole milk (3.68 per cent. milk fat) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
77.89	14.80	6.24		21.04	Cream, 19%[2]	4 gals., 1 pt.	82 gals., 3½ pts.
2.44	.03	2.34		2.37	Powdered Skim milk	1 lb., 1¼ oz.	21 lbs., 11 oz.
4.534	.17	.41		.58	Whole milk (3.69% milk fat)	2 pts.	4 gals., 5¾ pts.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals		

Cream, 30 per cent. with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
46.61	13.98	3.45		17.43	Cream, 30%	2 gals., 3½ pts.	48 gals., 6¼ pts.
27.084	1.00	2.45		3.45	Whole milk (3.69% milk fat)	1 gal., 3¼ pts.	28 gals., 1¾ pts.
11.17	.02	3.09		3.11	Condensed skim milk (3 to 1)	4¼ pts.	10¾ gals.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]Lowest standard of cream that can be used to make 15 per cent. mix.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

15 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
37.92	13.65	2.70		16.35	Cream, 36%	2 gals., ¼ pt.	40¾ gals.
35.974	1.33	3.25		4.58	Whole milk (3.69% milk fat)	1 gal., 7 pts.	37½ gals.
10.97	.02	3.04		3.06	Condensed skim milk (3 to 1)	4¼ pts.	10 gals., 4½ pts.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals.....		

Cream, 40 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
37.40	14.96	2.60		17.56	Cream, 40%	2 gals., 1 pt.	40¼ gals.
10.86	.02	3.01		3.03	Condensed skim milk (3 to 1)	4¼ pts.	10 gals., 3½ pts.
36.604	.02	3.38		3.40	Skim milk	1 gal., 7¼ pts.	38 gals.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.235			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

15 PER CENT. MIX for ICE-CREAM

Unsalted butter, with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
18.01	14.95	.27		15.22	Unsalted butter	8 lbs., 1 oz.	160 lbs., 14 oz.
53.064	.03	4.90		4.93	Skim milk	2¾ gals.	55 gals., ¾ pt.
13.79	.02	3.82		3.84	Condensed skim milk (3 to 1)	5¼ pts.	13 gals., 2¼ pts.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
17.93	14.88	.27		15.15	Unsalted butter	8 lbs.	160 lbs., 2 oz.
9.10	.12	8.72		8.84	Powdered skim milk	4 lbs., 1 oz.	81¼ lbs.
57.834					Water	3 gals., ¾ pt	62 gals., ¾ pt.
12.61			12.56	12.56	Granulated sugar	5 lbs., 10 oz.	112 lbs., 10 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.293				.25	Gelatin	2 oz.	2 lbs., 10 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	15.00	8.99	12.83	37.18	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

16 PER CENT. MIX for ICE-CREAM

Weight of mix ..... **8.912 lbs. per gallon;**

If drawn when swell is at 103.33 per cent.,[1] weight of frozen Ice-Cream will be 4.38 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column.

Cream, 20 per cent.,[2] with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
79.85	15.97	6.33		22.30	Cream, 20%[2]	4 gals., 1¾ pts.	84 gals., 3 pts.
2.27	.03	2.18		2.21	Powdered skim milk	1 lb., ¼ oz.	20¼ lbs.
2.91		.27		.27	Skim milk	1¼ pts.	3 gals.
12.46			12.40	12.40	Granulated sugar	5 lbs., 9 oz.	111 lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.277				.23	Gelatin	2 oz.	2 lbs., 7½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.78	12.67	37.79	Percentage totals.		

Cream, 36 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
44.37	15.97	3.16		19.13	Cream, 36%	2 gals., 3 pts.	47 gals., 4¾ pts.
30.56	.02	2.82		2.84	Skim milk	1 gal., 4¾ pts.	31 gals., 5¼ pts.
10.10	.01	2.80		2.81	Condensed skim milk (3 to 1)	3¾ pts.	9 gals., 5½ pts.
12.46			12.40	12.40	Granulated sugar	5 lbs., 9 oz.	111 lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.277				.23	Gelatin	2 oz.	2 lbs., 7½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.78	12.67	37.79	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]Lowest standard of cream that can be used to make 16 per cent. mix.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

16 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
36.41	14.56	2.53		17.09	Cream, 40%	1 gal., 7¾ pts.	39 gals., 1¼ pts.
38.67	1.43	3.50		4.93	Whole milk (3.69% milk fat)	2 gals.	40 gals., 1½ pts.
9.95	.01	2.75		2.76	Condensed skim milk (3 to 1)	3 ¾pts.	9 gals., 4½ pts.
12.46			12.40	12.40	Granulated sugar	5 lbs., 9 oz.	111 lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.277				.23	Gelatin	2 oz.	2 lbs., 7½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.78	12.67	37.79	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
19.13	15.88	.29		16.17	Unsalted butter	8½ lbs.	170½ lbs.
8.86	.12	8.49		8.61	Powdered skim milk	3 lbs., 15 oz.	78 lbs., 15 oz.
56.52					Water	3 gals., ½ pt.	61 gals., ¾ pt.
12.46			12.40	12.40	Granulated sugar	5 lbs., 9 oz.	111 lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.277				.23	Gelatin	2 oz.	2 lbs., 7½ oz.
.517					Vanilla flavoring	To suit	To suit
.003					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.78	12.67	37.79	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

16 PER CENT. MIX for ICE-CREAM

With Total Solids Held Down to 37½ Per Cent.

Weight of mix..... 8.89 lbs. per gallon;

If drawn when swell is at 102.60 per cent.,[1] weight of frozen Ice-Cream will be 4.39 lbs. per gallon.

Cream, 30 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
50.18	15.05	3.71		18.76	Cream, 30%	2 gals., 5½ pts.	53 gals., 3½ pts.
25.454	.94	2.30		3.24	Whole milk (3.69% milk fat)	1 gal., 2½ pts.	26 gals., 1½ pts.
9.59	.01	2.66		2.67	Condensed skim milk (3 to 1)	3¾ pts.	9 gals., 1½ pts.
12.26			12.21	12.21	Granulated sugar	5 lbs., 7 oz.	109 lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.67	12.48	37.50	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
19.134	15.88	.29		16.17	Unsalted butter	8 lbs., 8 oz.	170 lbs., 2 oz.
8.74	.12	8.38		8.50	Powdered skim milk	3 lbs., 14 oz.	77 lbs., 11 oz.
57.35					Water	3 gals., ½ pt.	61 gals., 2¼ pts.
12.26			12.21	12.21	Granulated sugar	5 lbs., 7 oz.	109 lbs.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	16.00	8.67	12.48	37.50	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

17 PER CENT. MIX for ICE-CREAM

Weight of mix.....8.891 lbs. per gallon;
If drawn when swell is at 105 per cent.,[1] weight of frozen Ice-Cream will be 4.34 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column.

Cream, 21 per cent.,[2] with powdered skim milk and whole milk (3.69 per cent. milk fat) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
80.33	16.87	6.31		23.18	Cream, 21%[2]	4 gals.,2¼ pts.	84 gals., 6¼ pts.
2.10	.03	2.01		2.04	Powdered skim milk	15 oz.	18 lbs., 11 oz.
2.787	.10	.25		.35	Whole milk (3.69% milk fat)	1¼ pts.	2 gals. 7¼ pts.
12.29			12.23	12.23	Granulated sugar	5 lbs., 7 oz.	109¼ lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts
.26				.22	Gelatin	2 oz.	2 lbs., 5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.57	12.50	38.40	Percentage totals		

Cream, 30 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
56.60	16.98	4.19		21.17	Cream, 30%	3 gals.	60¼ gals.
9.41	.01	2.61		2.62	Condensed skim milk (3 to 1)	3½ pts.	9 gals.
19.207	.01	1.77		1.78	Skim milk	1 gal.	19 gals., 6¾ pts.
12.29			12.23	12.23	Granulated sugar	5 lbs., 7 oz.	109¼ lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals.. 1½ pts.
.26				.22	Gelatin	2 oz.	2 lbs., 5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.57	12.50	38.40	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.
[2]Lowest standard of cream that can be used to make 17 per cent., mix.
[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

17 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with whole milk (3.69 per cent. butter fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
39.05	15.62	2.71		18.33	Cream, 40%	2 gals., ¾ pt.	41 gals., 6¼ pts.
37.147	1.37	3.36		4.73	Whole milk (3.69% milk fat)	1 gal., 7½ pts.	38 gals., 4½ pts.
9.02	.01	2.50		2.51	Condensed skim milk (3 to 1	3½ pts.	8 gals., 5¼ pts.
12.29			12.23	12.23	Granulated sugar	5 lbs., 7 oz.	109¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.26				.22	Gelatin	2 oz.	2 lbs., 5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.57	12.50	38.40	Percentage totals		

Unsalted butter, with powdered skim milk and butter added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
20.34	16.88	.31		17.19	Unsalted butter	9 lbs., 1 oz.	180 lbs., 13 oz.
8.62	.12	8.26		8.38	Powdered skim milk	3 lbs., 13 oz.	76 lbs., 10 oz.
56.257					Water	3 gals.	60 gals., ¾ pts.
12.29			12.23	12.23	Granulated sugar	5 lbs., 7 oz.	109¼ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.26				.22	Gelatin	2 oz.	2 lbs., 5 oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.57	12.50	38.40	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

17 PER CENT. MIX for ICE-CREAM

With total solids held down to 37½ per cent.

Weight of mix.....8.86 lbs. per gallon;

If drawn when swell is at 102.7 per cent.,[1] weight of frozen Ice-Cream will be 4.37 lbs. per gallon.

Cream, 36 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
47.14	16.97	3.36		20.33	Cream, 36%	2½ gals.	50¼ gals.
31.684	.02	2.93		2.95	Skim milk	1 gal. 5 pts.	32 gals., 5 pts.
6.94	.01	1.92		1.93	Condensed skim milk (3 to 1)	2¾ pts.	6 gals., 5 pts.
11.72			11.67	11.67	Granulated sugar	5 lbs., 3 oz.	103 lbs., 13 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.21	11.94	37.50	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
20.35	16.89	.31		17.20	Unsalted butter	9 lbs.	180 lbs., 5 oz.
8.247	.11	7.90		8.01	Powdered skim milk	3 lbs., 10 oz.	73 lbs., 1 oz.
57.167					Water	3 gals., ¼ pt.	60 gals., 7 pts.
11.72			11.67	11.67	Granulated sugar	5 lbs., 3 oz.	103 lbs., 13 oz.
2.233				.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	17.00	8.21	11.94	37.50	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

18 PER CENT. MIX for ICE-CREAM

Weight of mix..... 8.869 lbs. per gallon;

If drawn when swell is at 106.67 per cent.,[1] weight of frozen Ice-Cream will be 4.29 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column.

Cream, 22 per cent.,[2] with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids (lbs.)	Total Solids, (lbs.)			
81.68	17.97	6.39		24.36	Cream, 22%[2]	4 gals., 2½ pts.	86 gals , 1 pt.
1.88	.03	1.80		1.83	Powdered skim milk	13¼ oz.	16 lbs., 11 oz.
1.853		.17		.17	Skim milk	¾ pts.	1 gal., 7¼ pts.
12.11			12.06	12.06	Granulated sugar	5 lbs., 6 oz.	107 lbs., 7 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.244				.21	Gelatin	1¾ oz.	2 lbs., 2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	8.36	12.33	39.01	Percentage totals		

Cream, 30 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
59.93	17.98	4.43		22.41	Cream, 30 per cent	3 gals., 1½ pts.	63 gals., 5 pts.
8.55	.01	2.37		2.38	Condensed skim milk (3 to 1)	3¼ pts.	8 gals., 1¼ pts.
16.933	.01	1.56		1.57	Skim milk	7 pts.	17 gals., 3¾ pts.
12.11			12.06	12.06	Granulated sugar	5 lbs., 6 oz.	107 lbs., 7 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.244					Gelatin	1¾ oz.	2 lbs., 2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	8.36	12.33	39.01	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.
[2]Lowest standard of cream that can be used to make 18 per cent. mix.
[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

18 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
46.87	16.87	3.34		20.21	Cream, 36%	2½ gals.	50 gals., ¼ pt.
30.323	1.12	2.74		3.86	Whole milk (3.69% milk fat)	1 gal., 4½ pts.	31 gals., 3 pts.
8.22	.01	2.28		2.29	Condensed skim milk (3 to 1)	3¼ pts.	7 gals., 6¾ pts.
12.11			12.06	12.06	Granulated sugar	5 lbs., 6 oz.	107 lbs., 7 oz.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.244				.21	Gelatin	1¾ oz.	2 lbs., 2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	8.36	12.33	39.01	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
21.56	17.89	.32		18.21	Unsalted butter	9 lbs., 9 oz.	191 lbs., 3 oz.
8.39	.11	8.04		8.15	Powdered skim milk	3¾ lbs.	74 lbs., 7 oz.
55.463					Water	2 gals., 7¾ pts.	59 gals., 7¾ pts.
12.11			12.06	12.06	Granulated sugar	5 lbs., 6 oz.....	107 lbs., 7 oz.
2.233			.27	38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.244				.21	Gelatin	1¾ oz.	2 lbs., 2½ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	8.36	12.33	39.01	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

18 PER CENT. MIX for ICE-CREAM

With total solids held down to 37½ per cent.

Weight of mix..... 8.82 lbs. per gallon;

If drawn when swell is at 102.80 per cent.,[1] weight of frozen Ice-Cream will be 4.35 lbs. per gallon.

Cream, 40 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
41.23	16.49	2.86		19.35	Cream, 40%	2 gals., 1½ pts.	43 gals., 7 pts.
40.694	1.50	3.68		5.18	Whole milk (3.69% milk fat)	2 gals., ¾ pt.	41 gals., 7 pts.
4.38	.01	1.21		1.22	Condensed skim milk (3 to 1)	1 ¾ pts.	4 gals., 1¼ pts.
11.18			11.13	11.13	Granulated sugar	4 lbs., 15 oz.	98 lbs., 10 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	7.75	11.40	37.50	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
21.57	17.90	.32		18.22	Unsalted butter	9½ lbs.	190 ¼lbs.
7.75	.10	7.43		7.53	Powdered skim milk	3 lbs., 7 oz.	69 lbs., 6 oz.
56.984					Water	3 gals., ¼ pt.	60 gals., 3¼ pts.
11.18			11.13	11.13	Granulated sugar	4 lbs., 15 oz.	98 lbs., 10 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	18.00	7.75	11.40	37.50	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

19 PER CENT. MIX FOR ICE-CREAM

Weight of mix..... 8.85 lbs. per gallon;

If drawn when swell is at 108.33 per cent.,[1] weight of frozen Ice-Cream will be 4.25 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Cream, 23 per cent.,[2] with powdered skim milk and whole milk (3.69 per cent. milk fat) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
82.26	18.92	6.38		25.30	Cream, 23%[2]	4 gals., 2¾ pts.	86 gals., 5½ pts.
1.68	.02	1.61		1.63	Powdered skim milk	12 oz.	14 lbs., 14 oz.
1.65	.06	.15		.21	Whole milk (3.69% milk fat)	¾ pt.	1 gal., 5½ pts.
11.95			11.90	11.90	Granulated sugar	5 lbs., 5 oz.	105¾ lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.227				.19	Gelatin	1½ oz.	2 lbs., 1¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	8.14	12.17	39.61	Percentage totals		

Cream, 30 per cent., with condensed skim milk (3 to 1 concentration) and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
63.27	18.98	4.68		23.66	Cream, 30%	3 gals., 3 pts.	67 gals., ¼ pt.
7.57	.01	2.10		2.11	Condensed skim milk (3 to 1)	2¾ pts.	7 gals., 1¾ pts.
14.75	.01	1.36		1.37	Skim milk	6 pts.	15 gals., 1½ pts.
11.95			11.90	11.90	Granulated sugar	5 lbs., 5 oz.	105¾ lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.227				.19	Gelatin	1½ oz.	2 lbs., ¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	8.14	12.17	39.61	Percentage totals		

[1]Freezer should have sufficient excess capacity to admit of the swell.

[2]Lowest standard of cream that can be used to make 19 per cent. mix.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

19 PER CENT. MIX for ICE-CREAM

Cream, 36 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lb)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
49.83	17.94	3.55		21.49	Cream, 36%	2 gals., 5½ pts.	53 gals., ½ pt.
28.49	1.05	2.58		3.63	Whole milk (3.69% milk fat)	1 gal., 3¾ pts.	29 gals., 3 pts.
7.27	.01	2.01		2.02	Condensed skim milk (3 to 1)	2¾ pts.	105¾ lbs.
11.55			11.90	11.90	Granulated sugar	5 lbs., 5 oz.	105¾ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.227				.19	Gelatin	1½ oz.	2 lbs., ¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	8.14	12.17	39.61	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
22.76	18.89	.34		19.23	Unsalted butter	10 lbs., 1 oz.	201 lbs., 7 oz.
8.14	.11	7.80		7.91	Powdered skim milk	3 lbs., 10 oz.	72 lbs., 1 oz.
54.69					Water	2 gals., 7¼ pts.	58 gals., 1¼ pts.
11.95			11.90	11.90	Granulated sugar	5 lbs., 5 oz.	105¾ lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.227				.19	Gelatin	1½ oz.	2 lbs., ¼ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	8.14	12.17	39.61	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

19 PER CENT. MIX for ICE-CREAM

With total solids held down to 37½ per cent.

Weight of mix..... 8.77 lbs. per gallon;

If drawn when swell is at 102.85 per cent.,[1] weight of frozen Ice-Cream will be 4.30 lbs. per gallon.

Cream, 30 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
63.31	18.99	4.69		23.68	Cream, 30%	3 gals., 2¾ pts.	66 gals., 5¼ pts.
21.254	.01	1.96		1.97	Skim milk	1 gal., ¾ pt.	21 gals., 5¼ pts.
2.27		.63		.63	Condensed skim milk (3 to 1)	¾ pt.	2 gals., 1¼ pts.
10.65			10.60	10.60	Granulated sugar	4 lbs., 11 oz.	93 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.223				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	7.22	10.87	37.50	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
22.77	18.90	.34		19.24	Unsalted butter	10 lbs.	199 lbs., 11 oz.
7.24	.10	6.94		7.04	Powdered skim milk	3 lbs., 3 oz.	63½ lbs.
56.824					Water	3 gals.	59 gals., 7 pts.
10.65			10.60	10.60	Granulated sugar	4 lbs., 11 oz.	93 lbs., 11 oz.
2.233			.27	.38	Meloine solution[2]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	19.00	7.28	10.87	37.50	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

20 PER CENT. MIX for ICE-CREAM

Weight of mix ..... 8.83 lbs. per gallon;

If drawn when swell is at 110 per cent.,[1] weight of frozen Ice-Cream will be 4.20 lbs. per gallon.

40-qt. freezer: size batch, 5 gals., as given in next to last column;
60-qt. freezer: size batch, 7½ gals., 1½ times quantities in next to last column;
80-qt. freezer: size batch, 10 gals., twice quantities in next to last column;
100-qt. freezer: size batch, 12½ gals., 2½ times quantities in next to last column;
120-qt. freezer: size batch, 15 gals., 3 times quantities in next to last column;

Cream, 24 per cent.,[2] with powdered skim milk and skim milk added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
83.28	19.98	6.40		26.38	Cream, 24%[2]	4 gals., 3 pts.	87½ gals.
1.50	.02	1.44		1.46	Powdered skim milk	10½ oz.	13¼ lbs.
.996		.09	.....	.09	Skim milk	½ pt.	1 gal., ¼ pt.
11.78			11.73	11.73	Granulated sugar	5 lbs., 3 oz.	104 lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.211				.18	Gelatin	1½ oz.	1 lb., 13¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	7.93	12.00	40.22	Percentage totals		

Cream, 30 per cent., with whole milk (3.69 per cent. milk fat) and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs'	Total Solids, (lbs.)			
64.88	19.46	4.80		24.26	Cream, 30%	3 gals., 3½ pts.	68 gals., 4½ pts.
14.246	.53	1.29		1.81	Whole milk (3.69% milk fat)	6 pts.	14 gals., 5¼ pts.
6.65	.01	1.84		1.85	Condensed skim milk (3 to 1)	2½ pts.	6 gals., 2½ pts.
11.78			11.73	11.73	Granulated sugar	5 lbs., 3 oz.	104 lbs.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.211				.18	Gelatin	1½ oz.	1 lb., 13¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	7.93	12.00	40.22	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]Lowest standard of cream that can be used to make 20 per cent. mix.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

20 PER CENT. MIX for ICE-CREAM

Cream, 40 per cent., with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
49.95	19.98	3.47		23.45	Cream, 40%	2 gals. 5¼ pts.	53¼ gals.
29.596	.01	2.73		2.74	Skim milk	1 gal., 4¼ pts.	30 gals., 3 pts.
6.23	.01	1.73		1.74	Condensed skim milk (3 to 1)	2¼ pts.	5 gals., 7½ pts.
11.78			11.73	11.73	Granulated sugar	5 lbs., 3 oz.	104 lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.211				.18	Gelatin	1½ oz.	1 lb., 13¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	7.93	12.00	40.22	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
23.969	19.89	.36		20.25	Unsalted butter	10 lbs., 9 oz.	211 lbs., 10 oz.
7.90	.11	7.57		7.68	Powdered skim milk	3½ lbs.	69¾ lbs.
53.907					Water	2 gals., 6¾ pts.	57 gals., 1½ pts.
11.78			11.73	11.73	Granulated sugar	5 lbs., 3 oz.	104 lbs.
2.233			.27	.38	Meloine solution[1]	1 pt.	2 gals., 1½ pts.
.211				.18	Gelatin	1½ oz.	1 lb., 13¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	7.93	12.00	40.22	Percentage totals		

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

20 PER CENT MIX for ICE-CREAM

With total solids held down to 37½ per cent.

Weight of mix, 8.74 lbs. per gallon.

If drawn when swell is at 102.95 per cent.,[1] weight of frozen Ice-Cream will be 4.30 lbs. per gallon.

Unsalted butter[2], with skim milk and condensed skim milk (3 to 1 concentration) added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
24.06	19.97	.36		20.33	Unsalted butter[2]	10 lbs., 8¼ oz.	210 lbs., 4½ oz.
60.004	.03	5.54		5.57	Skim milk	3 gals., ½ pt.	60 gals., 7¾ pts.
3.31		.92		.92	Condensed skim milk (3 to 1)	1¼ pts.	3 gals., 1 pt.
10.11			10.06	10.06	Granulated sugar	4 lbs., 7 oz...	88 lbs., 6 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	6.82	10.33	37.50	Percentage totals		

Unsalted butter, with powdered skim milk and water added.

100 Pound Mix					Ingredients	5 Gal. Mix	100 Gal. Mix
Pounds	Milk Fat or Butter Fat, (lbs.)	Milk Solids Not Fat, (lbs.)	Sugar Solids, (lbs.)	Total Solids, (lbs.)			
23.99	19.91	.36		20.27	Unsalted butter[2]	10½ lbs.	209 lbs., 11 oz.
6.74	.09	6.46		6.55	Powdered skim milk	2 lbs., 15 oz.	58 lbs., 14 oz.
56.644					Water	2 gals., 7¾ pts.	59½ gals.
10.11			10.06	10.06	Granulated sugar	4 lbs., 7 oz.	88 lbs., 6 oz.
2.233			.27	.38	Meloine solution[3]	1 pt.	2 gals., 1½ pts.
.283				.24	Gelatin	2 oz.	2 lbs., 8¾ oz.
To suit					Vanilla flavoring	To suit	To suit
To suit					Malaboza Pure Food Color	To suit	To suit
100.	20.00	6.82	10.33	37.50	Percentage totals		

[1]Freezers should have sufficient excess capacity to admit of the swell.

[2]Unsalted butter is the only fat-supplying milk product which can be used with milk (either skim or whole) and condensed skim milk to make 20 per cent. mix where the solids are held down to 37.50 per cent.

[3]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, in order to preserve the accuracy of the formula, but it can be added at once.

OPERATION

Suitable ingredients are a primary necessity; but correct methods and efficient service are fully as important in profitably producing a commercial Ice-Cream that will please and serve its purpose, in building up a permanent business.

Modern methods mean more than mixing together available supplies, turning the freezer, and dishing out the haphazard product. Ever increasing consumption makes mass production more and more a necessity. Huge quantities of Ice-Creams and related products must be kept ready for instant demand. Whether they are held under the more or less perfect conditions prevailing in the modern hardening room, or in the dispensing cabinet, the products must be always smooth, mellow, appealing to eye and taste, and having satisfactory dishing quality to the final dipperful. Official supervision demands a degree of sanitary and hygienic perfection, from the production of ingredients to the serving of the finished product, that insures the purest and most wholesome food and confection the present state of advancement permits.

A small output is still economically possible; but large production, under the conditions outlined, requires a series of exact processes which must be carefully studied, for economy as well as for efficiency, before costly machinery is introduced. Mixing, pasteurizing, homogenizing or emulsing, cooling, ripening, freezing, hardening, packing, and delivery—all require special, costly equipment, and the circumspect Ice-Cream maker must see that he does not go further than the size of his business warrants.

The condition of the dairy supplies determines what processes are necessary. Proper connection with sanitary dairies and creameries, for instance, may save the cost of pasteurizers, just as Meloine and Mello-Freeze make it possible to dispense with fully half the refrigeration and storage vats or cans, and with much of the space, without detriment to capacity.

Co-ordination of the different processes is of the utmost importance. They must follow, in correct sequence, without unnecessary expenditure of refrigeration and power, at the lowest cost for which a desirable product can be put out in a sanitary manner. The capacities of the equipment for the several processes must harmonize so that the flow may be perfectly controlled, constant and always uniform, and always getting maximum efficiency out of each successive step. It is important that the cooler (sometimes known as aerator) be large enough to cool the mix properly as fast as it comes from the homogenizer, pasteurizer and mixer, and as fast as the holding vats or aging cans are filled and have the Meloine or Mello-Freeze stirred into them.

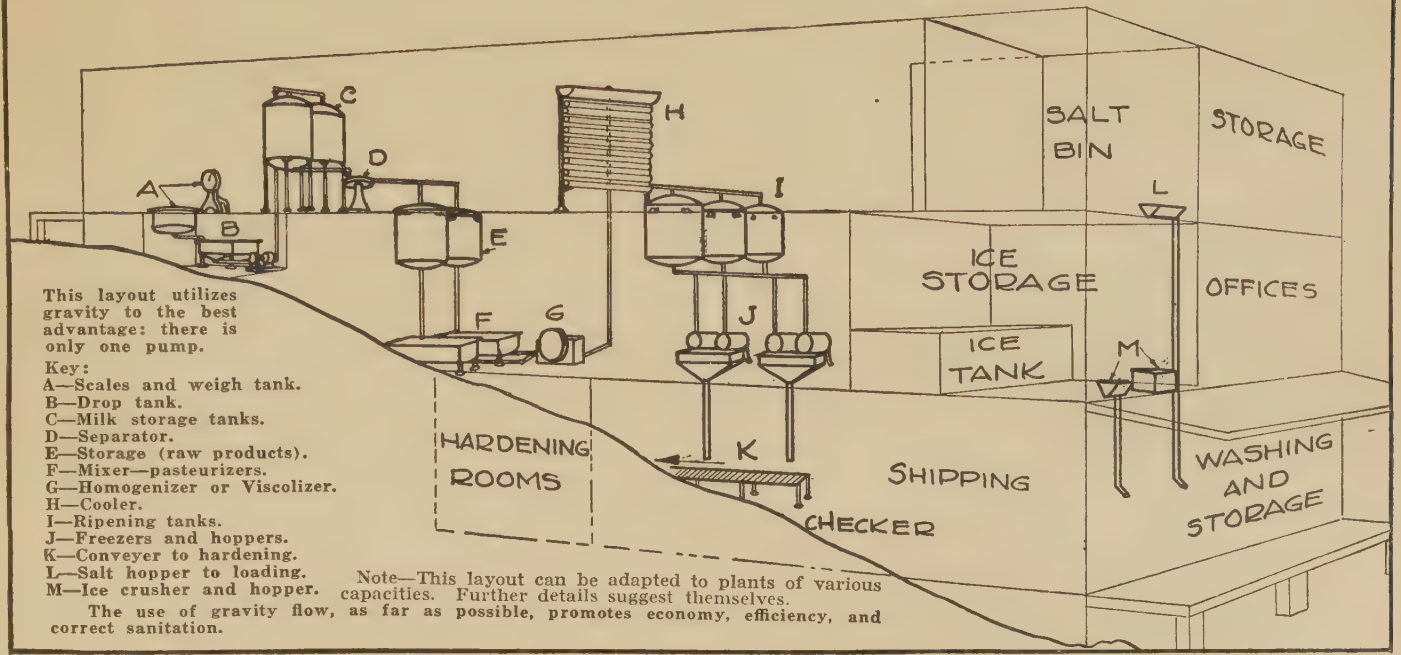
A gravity system, by which the mixer is on the highest level with the raw materials, and each successive operation on a lower level, economizes power and reduces or avoids pumping, and the equipment can generally be kept sweet and clean more easily.

If you use pumps, place them below the source of supply and keep a constant, unchanging level in the milk or mix pumped. Use sanitary centrifugal pumps and sanitary piping. Use no more piping than necessary: the pumps, the piping, and all other machinery and equipment which comes in contact with the milk products, should be carefully cleaned with Tru-White Washing Powder after each use and scalded with boiling water or steam.

Unnecessary processing is unnecessary overhead cost. It is an advantage to mix and pasteurize in one operation: that is, in the same container, without the necessity of first conveying the mix to a separate pasteurizer. The increasing multiplicity of machinery and equipment may serve to improve the product economically when there is business enough to run at full capacity. But it must not be overlooked that the investment remains under a reduced output and that the cost of running that reduced output is relatively higher than the cost of running a capacity output—so much higher, perhaps, that the product may be sold at an actual loss. This accounts for the fact that the small producer, practically without mechanical equipment, can successfully compete with large plants that are equipped with ponderous machinery and labor saving contrivances. The smaller manufacturer has little overhead cost to worry about in dull seasons. He prospers, if his product excels, while the big industrialist worries about the leak of a fraction of a cent per gallon of output.

A HILLSIDE ICE-CREAM PLANT OPERATING BY GRAVITY

Designed for Heller's Guide for Ice-Cream Makers, by H. A. Stuart, of the Pfaudler Co., Rochester, N. Y.



This layout utilizes gravity to the best advantage: there is only one pump.

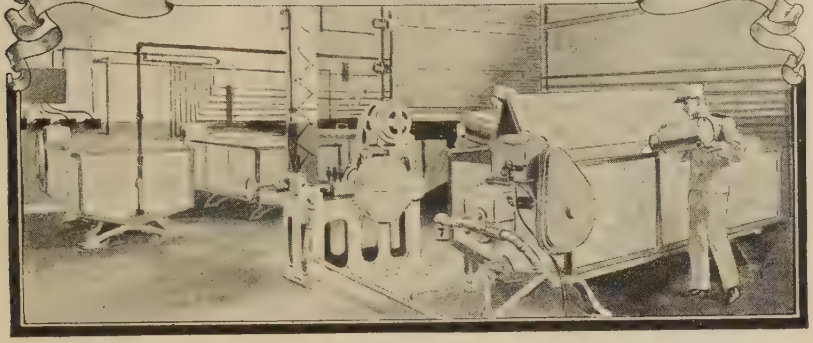
Key:
A—Scales and weigh tank.
B—Drop tank.
C—Milk storage tanks.
D—Separator.
E—Storage (raw products).
F—Mixer—pasteurizers.
G—Homogenizer or Viscolizer.
H—Cooler.
I—Ripening tanks.
J—Freezers and hoppers.
K—Conveyer to hardening.
L—Salt hopper to loading.
M—Ice crusher and hopper.

Note—This layout can be adapted to plants of various capacities. Further details suggest themselves.

The use of gravity flow, as far as possible, promotes economy, efficiency, and correct sanitation.

Condensing under vacuum does not do away with the necessity of first standardizing the mix. In fact it is merely an added cost, the sole advantage of which is in eliminating or reducing objectionable odors by boiling at lowered temperature. Whether the advantage really exists or not, whether it is sufficient to offset the higher cost of odorless supplies, and whether an occasional lot of inferior butter warrants the regular processing of all mixes—those are things which the Ice-Cream maker must decide for himself. During the rush season, the fewer the middlemen, the less the chance of delay. The condenser is himself dependent on the sources of supply, and the Ice-Cream maker who contracts directly for his milk and cream thereby promotes both economy and efficiency. If he does get an excess of milk or cream in spring, it is an added advantage, as it enables him to store against the shortage of midsummer.

MIXING



The name, "mix," is commonly used in the trade to designate the mixture of the Ice-Cream ingredients in the unfrozen state, just as "dough" is used for unbaked bread, and "batter" for pancake material.

The name, "batch," is for the quantity mixed at one time or in one lot and may cover one or more freezer loads.

Every step is important, in the making of a uniformly good marketable Ice-Cream, and carelessness at any stage in the manufacture may injure if not ruin a batch and waste the efforts spent on it at other stages. It is important, therefore, that cleanliness, precision, care, and attention to detail characterize the activities of the Ice-Cream maker from first to last. Above all, begin right: use the right materials in their best condition, in their correct proportion, and in the best manner that circumstances permit. The quality of the ingredients will directly affect the quality of the Ice-Cream.

Decide on the fat standard, which must govern the proportions of other ingredients. The table on page 397 shows the present requirements of each state, ranging between 7 per cent. for Massachusetts and 14 per cent. for Federal regulation and ten of the states. There is not enough improvement in flavor to warrant the cost of increasing the milk fat or butter fat content beyond 12 per cent. when other ingredients are in correct relative proportion.[1] With Meloine or Mello-Freeze a higher fat content may well be regarded as wasteful, unless required by law.

Then decide on the formula to be adopted. The formulas on pages

[1]Prof. R. C. Fisher, Dairying, Conn. Agric. Coll., Convention New Eng. Assn. I. C. Mfrs.

124 to 192 are so grouped, under each fat standard as to illustrate the use of any combination of available ingredients. The smoothness and swell are practically the same for all formulas under a given standard, because the percentage of fat, milk solids not fat, sugar, and total solids is alike for all in that group. Any difference in flavor and appearance will be due to the flavor, age and condition of the ingredients and to the manner and efficiency of handling. The danger of a "cooked" flavor has been reduced to the minimum because the proportions of milk concentrates are held below the danger points.

Nevertheless, Ice-Cream made with cream will have a flavor which differs from that made with butter: that made with milk powder will be unlike in flavor to that made with condensed milk. It is best, on the whole, to give preference to formulas which use cream for fat, skim milk and condensed skim milk to provide volume and most of the body.

The prudent Ice-Cream maker, large or small, will select the formula for which ingredients are most likely to be available at all times and in most uniform quality. He has the assurance then that he not only has the best formula possible with the materials at hand, under his fat standard, but also that he will have an unvarying quality product at all seasons, perfectly balanced, without waste and yet smooth, palatable and of good resistance (that is, with the ability to stand up).

If the local market milk or cream is not the same as that called for in the favored formula, then it may be necessary to standardize it in the manner explained on pages 103 and 119. That will not alter the fat or solids content and will not affect the quality. Aside from such possible modification, stick to the formula adopted until supplies become unavailable and force a change. Any material variation from the prescribed quantity or quality of any one ingredient will upset the balance for all other ingredients. Follow your formula to the letter and standardize your work, your methods, and your processes. Dependable uniformity is an important asset in building up a business.

Tests of ingredients are advisable, for without them it may be difficult to produce uniformly excellent Ice-Cream. Any intelligent person can make the routine tests of milk, cream, and acidity with the compact, convenient laboratory equipments now sold. No person should fail to recognize any ingredient that is grossly unfit for use in the Ice-Cream mix. In large operations, however, more exact and more difficult determinations are called for, and a thoroughly competent chemist may easily earn his cost with a single correction. Extracts and colors are a costly necessity and, unless they are of the unvarying purity, strength and quality of B. Heller & Company products, every item should be tested.

Correct scales and measures must be ready at hand, convenient to use, and adequate for the purpose. No matter whether the business is large or small, it will prove profitable if you standardize your practices to conform with this book and weigh or measure every ingredient ac-

curately according to formula. If a split or fractional quantity of anything is to be measured repeatedly, it will save time and promote uniform accuracy to mark the exact total quantity on a measure and then either to cut down the measure to that mark or to have one made containing that exact quantity at one dipping. Thus there can be a separate measure for gelatin, for Meloine solution, for vanilla flavor, or for any other ingredient, each measure holding, when level full, the exact quantity used in a batch of regular size. Clean them after each working period, if not after each use. Have a convenient place for everything.

The mix can be made in any smooth, clean, container; but galvanized iron should be avoided. Where the mix is pasteurized, it is usually more efficient to assemble and prepare the batch directly in the pasteurizer: otherwise the batch can be made ready in a special mechanical mixing tank or (in small operations) directly in a smooth, well-tinned, clean Ice-Cream packing can. If there is no mechanical agitator, a clean paddle may be used for stirring until all solid ingredients are dissolved and none left in the corners or angles at the bottom. Where space admits of it, efficiency and economy may be promoted by mixing on a high level so that the mix may flow by gravity to each succeeding process, without the use of pumps. If a large vertical mixing tank is used, much work and effort can be saved by having the opening of the mixing tank just above the floor of the receiving and supply rooms.

First put in the milk, cream and other milk products. The necessary milk fat, more commonly known as butter fat, is supplied chiefly by cream or butter, though milk and even skim milk and their condensed and powdered products, all yield some fat. As the fat is the most expensive part of the mix, the cream which clings to the inner sides and bottom of cream cans must not be wasted. Dislodge it with a jet of steam and save every part, keeping it separate until the diluted fat can be tested for exact fat content that it may be used intelligently: otherwise it would upset the calculations of the formula used. The aggregate of the milk fat or butter fat in all the ingredients makes up the fat required by law or by individual preference. It is the milk fat that gives the mix the flavor and aroma of a dairy product.

That part of the milk or cream in which the fat is suspended is known as the serum. The casein or curd, the natural milk sugar, known as lactose, and the minerals, together are known as the serum solids or milk-solids-not-fat. They are a necessary part of Ice-Cream and are supplied chiefly by milk, skim milk, condensed milk, powdered milk, and to a smaller extent by cream and even butter. The definitely proportioned aggregate of such solids makes up the body on which depend the texture and resistance or ability to stand up.

All ingredients, even sugar and powdered milk, contain some moisture. This moisture is a necessary part of the mix. It holds the solids either in solution or in suspension; it supplies volume; and it furnishes material for the frozen walls of air cells which result from the action

of the dasher in the freezer. If the ingredients do not fully supply the necessary proportion of moisture or volume, then more milk, skim milk, or even added water must be used to make up the shortage.

After the milk products and such water as the formula calls for, add the sugar. Forget all preconceived notions about 14 or any other fixed per cent. of sugar. Our formulas give the exact proportion of sugar best suited to each particular mix. Any more or less will throw all other proportions out of balance, and the freezing and hardening may have to be differently adjusted to suit the change. Weigh off the sugar required by the formula, as accurately as you can with your scale, and stir it in. Do not agitate more than necessary to dissolve it, especially if the milk products were not properly cooled, as small lumps of butter may appear as a result. This is particularly true of mixtures of 12 per cent. Ice-Cream and upward.

If the mix is to be pasteurized, homogenized, or otherwise processed, sift the dry gelatin over the entire surface of the cold mix at this point, stir it in well for five minutes, and then turn on the heat. If a temperature of more than 160 degrees F. is reached in pasteurizing, then the gelatin must not be pasteurized in the mix, but add it in the manner described on page 65 for mixes that are not pasteurized.

If powdered milk is used, sift it over the mix when it is between 85 and 95 degrees F., on a rising temperature. Lumps that will not pulverize readily will not be apt to dissolve properly and will affect the flavor.

If butter is used, cut it in pieces weighing an ounce or two and add those to the mix before the heat is turned on. In that way, the moisture and serum solids content of the butter are sure to be added with it, in accordance with the provisions of the formula. If the butter is first melted and then added to the mix, there is sure to be more or less separation and the moisture and serum solids will be at least partly lost, affecting the accuracy of the mix to that extent. **Butter cannot be used in the Ice-Cream mix unless the mix is homogenized, viscolized or emulsified.** Agitate it briskly before such processing and continue the agitation till all is drawn over from the pasteurizer.

If you depend on a revolving coil for such agitation, fasten a narrow strip of metal along the length of the coil: it will then aid in dissolving the sugar and powdered milk as well as in keeping the molten butter distributed.

Do not add Meloine or Mello-Freeze, flavor, and color, until the mix is entirely cooled after pasteurizing and other processing.

If the mix is not to be pasteurized or heated for any other processing, warm a portion of the liquid part of the mix, whether milk or water, to about 90 degrees F. to dissolve such powdered milk as may be provided for in the formula. It takes about four parts (by weight) of

liquid to one part of powdered milk to dissolve it. When this is thoroughly done, stir the solution into the rest of the mix.

Take another part of the liquid to dissolve the gelatin in the manner described on page 65. It requires about nine or ten parts (by weight) of liquid to one part of gelatin to dissolve it. Though this is heated to 160 degrees F., it is necessary to cool it again to about 100 degrees before stirring it into the mix. The mix will be warmed to some extent by these additions and it should be promptly cooled to as near 40 degrees as circumstances and equipment permit, before adding either Meloine or Mello-Freeze and the flavor and color. Hold down acidity by keeping the temperature down.

If the mix is to be homogenized, the acidity should be determined and standardized before anything further is done. Even though it is to be merely pasteurized it is advisable at least to make sure the acidity is not so high as to curdle the mix by pasteurizing (see table, page 237).

Average milk has been calculated in the formulas as containing 3.69 per cent. butter fat. The Ice-Cream maker, in making similar calculations, may safely adopt the simpler figure of 3.7 per cent.

The primary object of pasteurization is to protect the consumer from possible harm by disease breeding (pathogenic) bacteria. It is not practicable to watch every person who comes in contact with the milk and with the utensils and containers, from the milking to the final processing. For that reason a method has been developed for the treatment of milk and milk products in such a way that they will be rendered harmless, without affecting the wholesomeness and palatableness of the product.

The secondary object is to check the rapid souring of the milk and cream and development of off flavors caused by bacteria. Milk, as drawn from the udder, is nearly if not quite sterile; but the teats of the cow, the hands of the milker, the milking machine and its pipe connections, the milk pail, strainers, cream separators, and all containers and utensils not treated with live steam, contain thousands and even millions of bacteria in seams and corners, which only await the rich warm milk to multiply. Most of these microscopic beings are lactic acid bacteria, so called because they convert the natural milk sugar (lactose) into lactic acid, which makes milk and cream increasingly sour till they reach the curdling or coagulating point. The time required for this souring at different temperatures is shown in the table on page 236. Correct pasteurization kills most of these bacteria so that the souring process is checked either until the number of bacteria is again increased for a rapid conversion of the milk sugar or until the reduced number of bacteria can convert the milk-sugar in longer time.

Health officers generally require that all milk and cream not certi-

fied by duly authorized medical or other authorities, must be pasteurized before they are used or consumed in the cities. Many of them require a further pasteurization by the Ice-Cream maker. But whether it is compulsory or not, it is best to pasteurize any Ice-Cream mix for which the milk and cream are obtained from unknown sources or from sources not vouched for by competent authorities, or which have a temperature of 55 degrees F. or more on arrival or thereafter. The one-half cent per gallon which pasteurization costs is a form of insurance that is usually worth all it costs. Do not use dairy products known to be unclean, whether the mix is pasteurized or not. Pasteurization cannot make a poor product good.

Pasteurization is a simple process of heating without cooking. It is not dependably effective below 145 degrees, and at unnecessarily high temperatures it may destroy some of the vitamins and cause an unpleasant "cooked" flavor. The length of time to heat the milk, cream or Ice-Cream mix, depends on the temperature at which it is held. 30 minutes at 145 degrees F. is commonly recommended by bacteriologists. At 185 degrees, we have sometimes killed all the bacteria in milk in 3 to 4 seconds. However, when pasteurization takes place at 180 degrees or more, it is known as flash pasteurization and the relative proportion of the surviving bacteria types is so altered that the milk will actually rot before it sours, because of the destruction of the lactic acid bacteria. The following table shows the time required for effective pasteurization in the destruction of harmful pathogenic bacteria at various temperatures.

Temperature of milk, cream or Ice-Cream mix (degrees F.)	Length of time to be held
145	30 minutes,
150	15 minutes,
155	8 minutes,
160	4 minutes,
165	2 minutes,
170	1 minute,
175	30 seconds,
180	15 seconds,
185	8 seconds,
190	4 seconds,

With these temperatures maintained the specified length of time, it is possible to reduce the number of bacteria as much as 99.93 per cent., and the keeping quality is increased accordingly. However, at 145 no appreciable change in taste or quality results and it is the temperature the Ice-Cream maker should adopt, holding at that the full 30 minutes.

The time consumed in reaching the desired temperature, must not

be included in the time required for that temperature: for instance, if it takes 10 minutes to reach the temperature of 145 degrees, the time for holding does not begin until the end of that 10 minutes, making a total of 40 minutes in the pasteurizer. Avoid slow heating, for that may cause souring and curdling before the pasteurization temperature is reached where quick heating would safely pass the danger point (55-115 degrees F.). Often the curdling is unnoticed until the mix comes over the tubes of the cooler in a flaky condition, like the curds and whey of a cheese factory.

Continuous pasteurization is not inferior to held batch pasteurization if the required temperature can be fully maintained, in the milk or other product, through the corresponding length of time shown in the foregoing table. If it can be arranged that the first to flow in and the last to flow out through the pasteurizer get the full time and temperature allotment as the rest of the flow, then it is not necessarily objectionable; but because of difficulty in accomplishing this, the continuous system is not recommended at this time.

Whatever the system, the temperature must not fluctuate. There must be either a thermostatic control of valves and flow, with recording thermometer, or an attendant who remains on the spot to regulate the heat and to see to it that the variation is never more than 3 degrees either way. Avoid equipment which stirs up large quantities of foam: such foam carries vast numbers of thermophilous bacteria: that is, bacteria which are unharmed through the pasteurization. Avoid also equipments which heat in spots, having pockets or eddies in which the heat is not equal to the remainder of the batch.

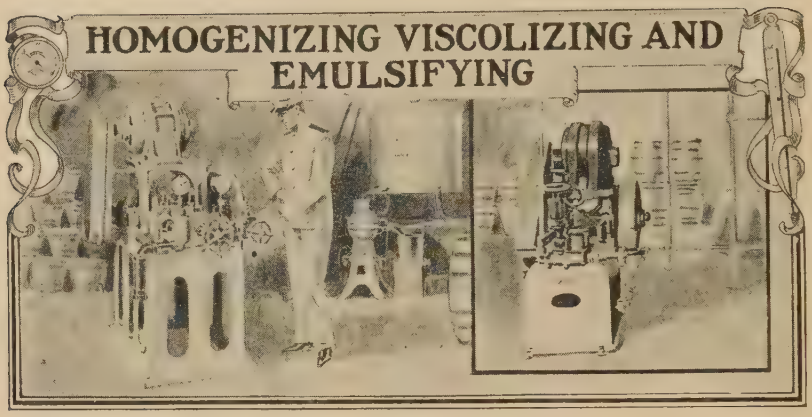
Do not let new milk or mix flow into a holding compartment until all the pasteurized product is out and the valve is tightly closed. Do not draw the pasteurized product into pipes, conveyors, cans, tanks or utensils, that have held raw milk or milk product without first cleaning and scalding them. Pasteurization is worse than useless if the pasteurized product is not properly safeguarded against subsequent contamination.

The pasteurizing equipment may be as simple or as elaborate as the volume of work demands. In large operations, the vat or tank with revolving steam or hot water coil is favored at this writing. If the product is homogenized, it may be economical to pasteurize alternately in two holding vats that there may always be one pasteurizing while the content of the other is drawn through the homogenizer. But an entirely satisfactory pasteurization can be had by heating a tank of water over a fire and placing the can containing the milk or Ice-Cream mix in the water: only see to it that the level of the liquid in the can is below the level of the hot water outside the can. Keep stirring the contents and take temperature readings, from time to time, so as to stay within the requirements of the table on page 203.

Cooling must follow pasteurizing as quickly and as sharply as the

plan of work permits. The multiplication of bacteria is most rapid in the range of temperature between 55 and 115 degrees F. The pasteurized milk or Ice-Cream mix must pass through that range as rapidly as correct method and proper equipment will let it. Either directly from the pasteurizer or by way of the homogenizer, viscolizer, or emulsifier, let the product flow over a series of cooling pipes or corrugations that are large enough and cold enough to cool it below 50 degrees F., preferably to 40 degrees. This style of cooling constitutes also a form of aeration which tends to remove weedy and vegetable odors sometimes introduced by feed stuffs which impart odors to the milk. If you have no tubular or other cooler, place the container as quickly as possible into ice water and agitate the contents, from time to time, with a newly cleaned paddle. When cooled to 40 degrees the batch is ready for Meloine or Mello-Freeze.

HOMOGENIZING VISCOLIZING AND EMULSIFYING



There are two main purposes in changing the physical condition of the Ice-Cream mix by the mechanical means of homogenizing, viscolizing and emulsifying: first, to prevent partial churning of the mix to butter in the freezer; second, to make it possible to use butter in Ice-Cream where and when cream and milk are not available. Butter cannot be melted and simply stirred into the mix without the use of a Homogenizer, a Viscolizer or an Emulsor: it would separate and return to butter in the freezer.

Both the swell and the freezing are retarded in proportion to the pressure and the consequent fineness of the fat globules. Beyond that, the process has no connection with the yield or swell: that is purely a result of correct ripening, either through storage and partial or complete souring or by the use of Meloine or Mello-Freeze. Pasteurization renders the mix "loose and sloppy" and homogenizing, viscolizing or emulsifying restores it to a degree of mechanical viscosity. Such swell as is produced in the process (an average of 2 per cent.) is beaten down by the dasher of the freezer before the actual and lasting swell is introduced.

The Homogenizer and the Viscolizer operate on similar principles, using a triplex or three-cylinder pump to get even, continuous pressure. This forces the heated materials through minute openings at a tremendous speed, breaking the fat globules of cream and butter, by the friction in the valve and by the impact against the housings, reducing them to one-third or less of their original size. The fat and other solids are distributed evenly and more permanently through the serum or through the mix. The cream cannot again be separated by centrifugal force

and the mix can be frozen, even under most unfavorable conditions, without danger of churning out pieces of butter.

The Emulsor and the Emulsifier, as used by the Ice-Cream maker, are intended only to make the use of butter possible where cream is not available. They are built on the lines of cream separators and meet the requirements of the small manufacturers. They divide the larger fat globules. While the emulsion is not permanent, there is no separation within the short time required for ripening when either Meloine or Mello-Freeze is used. If the ripened mix is put into the freezer at a low temperature (as near 40 degrees F. as circumstances permit), the dasher will not be apt to churn out butter.

The steam Emulser aims to emulsify butter with the mix by incorporating steam with it under pressure. It is apt to clog when powdered milk is used; it may scorch the dairy products, causing a "cooked" flavor; the indefinite quantities of steam condensing in the mix make it impossible to standardize the composition of an Ice-Cream: finally, the steam is apt to freeze into icy crystals, causing a coarse and unpalatable product. It is better not to use butter in the Ice-Cream mix than to make its use possible with a steam Emulser.

Either the milk products alone or the completed mix, without Meloine or Mello-Freeze, can be homogenized, viscolized or emulsified. The great bulk of the Ice-Cream is pasteurized, and homogenization is best done at a temperature approaching that of low-temperature pasteurizing. For these reasons it is economical to perform both operations with one heating. Pasteurize first at 145 degrees F. and pipe the product directly from the pasteurizer to the homogenizer. Neither the gelatin nor the other ingredients suffer from the operation.

The level of the Homogenizer, Viscolizer or Emulsor should not be above that of the supply tank, whether it be the mixing vat or the pasteurizer. Otherwise it will suck more or less air and so render the pressure unsteady and hard to control. If it must be placed higher, provide a sanitary centrifugal pump to raise the mix to the machine.

The mechanical viscosity of the mix varies according to the pressure, the acidity, the temperature, and to some extent according to the composition of the mix. High pressure produces greater viscosity than low pressure, a high degree of acidity produces greater viscosity than a low degree, and a cold mix has greater viscosity than a hot mix.

In order to turn out a uniform product, every process must be standardized as carefully as the ingredients themselves. The ideal method would be to have an always uniform mix, with an 0.18 per cent. acidity, always taken over from the pasteurizer between 142 and 145 degree F., and always put through the homogenizer under a pressure of 3750 lbs. to the inch. That would necessitate the use of well kept milk products of low acidity. In the absence of such supplies, either the milk or cream or the Ice-Cream mix can be neutralized to a definite, standard degree of acidity, as explained on pages 239 to 242.

The pressure must be governed by the acidity. The following table approximates the correct pressure when the Homogenizer style of machine is used. For the Viscolizer, the necessary pressure should be read about one-third less: thus the correct pressure for a mix of 0.18 per cent. acidity is 3750 on the Homogenizer and 2500 on the Viscolizer.

Relative Homogenizing Pressure at Different degrees of Acidity.[1]

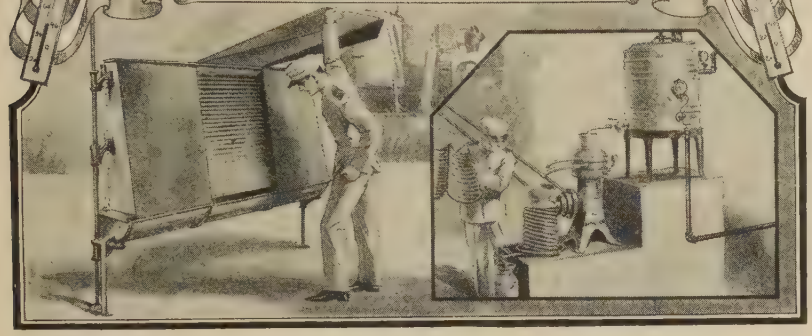
Lactic acid content of milk, cream or Ice-cream mix.	Homogenizing pressure, per square inch.
0.16 per cent.,	4000 pounds;
0.17 per cent.,	3875 pounds;
0.18 per cent.,	3750 pounds;
0.19 per cent.,	3625 pounds;
0.20 per cent.,	3500 pounds;
0.21 per cent.,	3375 pounds;
0.22 per cent.,	3250 pounds;
0.23 per cent.,	3125 pounds;
0.24 per cent.,	3000 pounds;
0.25 per cent.,	2875 pounds;
0.26 per cent.,	2750 pounds;
0.27 per cent.,	2625 pounds;
0.28 per cent.,	2500 pounds;
0.29 per cent.,	2375 pounds;
0.30 per cent.,	2225 pounds;
0.31 per cent.,	2075 pounds;
0.32 per cent.,	1900 pounds;
0.33 per cent.,	1700 pounds;

The homogenizing valves of all the types of machine become worn and scored: the higher the pressure, the greater the wear. Thorough homogenizing is then impossible. Examine and calibrate the valves at regular intervals, renewing them when necessary.

The construction of the machine must admit of ready cleaning. After each use or working period, clean it thoroughly with Tru-White washing powder and slightly warm water: rinse, and follow with scalding hot water or, better yet, with live steam. If the machine has stood unused a day or more, the same procedure can profitably be repeated before resuming operations. The prevention of bacterial growth and of the consequent acidity warrants almost any effort.

[1]Based on figures of Prof. R. C. Fisher, Dairying, Conn. Agr. Coll.

COOLING



Warm milk, warm cream, and warm Ice-Cream mix provide excellent media for the growth of lactic acid bacteria. At temperatures between 55 and 115 degrees F., they multiply rapidly and attack the natural milk sugar (lactose) in such numbers, converting it into lactic acid, that the milk or mix soon becomes sour and eventually curdles. The average time required for this at different temperatures is shown in the table on page 236. No matter if it is the body heat of freshly drawn milk or the result of pasteurizing, or of exposure to the sun or improper storage temperature, the effect is the same: warm milk is souring milk.

It is of the utmost importance, therefore, that the pasteurized mix be carried down through this range of temperature in the shortest possible time.

As soon after pasteurizing as possible, and as quickly as the equipment permits, the milk product or Ice-Cream mix must be cooled to 50 degrees F. or less: the nearer 40, the better. If the mix is merely pasteurized, sharp cooling must follow immediately. If it is homogenized or otherwise processed, it must be cooled immediately after that. The most economical arrangement is—pasteurizer to homogenizer to cooler. If the different operations can be performed on different levels, it is simpler to substitute gravity flow for pumping.

The most efficient cooler is the horizontal tubular or pipe ccoler. If there is enough cooling surface, it does not matter whether the pipes are straight or coiled in conical form. Commercially, coolers are rated according to their ability to cool from 100 degrees F. down to 50. For that reason care must be exercised in the selection of the size and

capacity to allow for the higher pasteurizing temperature and lower storing temperature. Let convenience in cleaning govern the choice if the cooling surface is equal. The correct size depends on the temperature at which the mix arrives over the cooler, the temperature to which it is to be cooled, the temperature and speed of the brine which circulates in the tubes, and the weather (atmospheric temperature). A continuous flow of ice water through the tubes is sufficient for cooling the pasteurized mix in winter; but during the warm months brine may have to be substituted in the lower tubes. At intervals during the cooling operation, temperature readings of the mix must be taken at the lower trough in order that steps may promptly be taken to regulate any irregularity. The exact regulation of the rate of flow into the distributing trough over the topmost tube, is an important factor in efficient work.

Such a cooler, when the jacket or cover is taken off, serves also to a limited extent as an aerator to remove "off" flavors. However, unless sanitary conditions prevail, such exposure is apt to do as much harm as the "off" flavor. Prevention is the best cure: request the dairyman and perhaps the creamery to issue instructions that cows be given the main feeding of silage, turnips, cabbage, green corn and green alfalfa only after milking, and that no such feeds be given at all during a period of at least an hour before milking. Wild onions and related plants should be rooted out on all dairy farms.

If the mix is cooled in cans or other containers, there should be fully four to five times as much ice water around the cans as there is hot mix in them. Keep the ice replenished so that a liberal quantity will always be in evidence in all quarters of the ice water tank. Stir the mix with an up and down motion, using a clean stirrer which consists of a perforated disk on a rod, a loop for a handle at the upper end, the whole heavily tinned. The stirring must be repeated at intervals of two to five minutes until the pasteurized mix is lowered to the desired temperature. If the stirrer is not left in the mix, it must be rinsed, scalded, and dried after each immersion. For efficient cooling and economy in the use of ice, the tank should be completely insulated and well covered.

After each use, scrub coolers and cans, piping and utensils with Tru-White washing powder in luke warm water, rinse and then scald with boiling water or sterilize with live steam.

RIPENING

A newly made mix, fresh from the mixer, is "thin" and fluid. Frozen in that condition, it could not have the necessary air economically incorporated into it and would, therefore, produce a hard, soggy Ice-Cream. Pasteurization makes it thinner, and the higher the temperature of pasteurization, the more marked and more lasting is the liquefaction. Homogenizing or viscolizing divides the fat globules, creating mechanically an artificial viscosity, and tends only to stabilize the emulsion and to make it smoother. Emulsifiers have a similar though less marked effect. But all such processes retard swell to the extent of their effectiveness. The various kinds of condensed milk are apt to render a mix more fluid than other milk products, if they are condensed at a temperature sufficiently high to kill certain biological properties or high enough to harden the protein bodies.

Ripening, and not mere viscosity, is necessary under all circumstances. But neither the purpose nor the manner of ripening an Ice-Cream mix has anything in common with the ripening of milk for cheese making. The latter is ripened at a temperature of perhaps 90 to 110, for flavor, while the Ice-Cream mix is ripened at a temperature of about 40 degrees F., to prevent the increase of lactic acid bacteria as much as possible, while developing a natural viscosity to facilitate the necessary incorporation of air.

The artificial viscosity created by mechanical processes is beaten out by the dasher of the freezer. Only proper ripening or mellowing of the mix can produce the biological change which expands the casein and prepares it for satisfactory swell of the mix in the freezer. Mere viscosity as such has not necessarily any effect on overrun.

Acidity is not a necessary part of ripening and must be held down in a quality product: in fact, the causes of acidity can operate to retard ripening. Acidity is produced at the expense of the lactose or natural milk sugar. But the normal lactose content, as well as the normal casein content, must be maintained to preserve the true flavor of fresh milk and cream. While lactic acid bacteria are decomposing the natural milk sugar, putrefactive bacteria may attack the proteins, producing "off" flavors and poisonous compounds. Time is all either of the two groups needs to destroy a mix and menace a reputation.

There are two methods of ripening or mellowing: first, by the use of Meloine or Mello-Freeze, and second by storage or aging.

The Meloine or Mello-Freeze method consists in adding a small quantity of "dissolved" Meloine or Mello-Freeze to the cooled mix, and holding it for a few hours or over night. The time required is definite and controllable, as shown by the table on page 72. The mix is always under control, insuring proper condition for quick freezing. This releases the storage vats or cans for a new batch and saves costly storage at low temperature. It helps to retain the flavor and aroma of wholesome, fresh milk and cream, tends to avoid the possible development of "off" flavors, and makes the Ice-Cream smooth, velvety and mellow. In a matter of hours it has the effect of days of storage, and does its work better. It makes a batch quickly available in an emergency and makes for efficiency and economy. It cuts down the time needed for ripening, thereby preventing inordinate increase in the bacterial count and avoiding the dangerous changes due to storage ripening. Consequently, Meloine or Mello-Freeze makes Ice-Cream more wholesome.

The storage method consists in holding the cooled mix for a period of time during which there is a development of bacteria that causes souring, bitterness and offensive odors. Storage will require from one and one-half to four days, depending on the temperature at which the mix is held, the temperature at which it was pasteurized, on whether or not it was homogenized or viscolized, and on the composition of the mix. Storage ripened mixtures, when processed, reach their maximum viscosity when aged from 72 to 96 hours.[1]

At best, storage ripening is uncertain and unreliable because the natural ripening agents are inadequate and uncontrollable. This is due in part to the action of pasteurizing and other processes and partly to the varying numbers of acid bacteria and other microörganisms. Based on such uncertain factors, the swell or yield is correspondingly uncertain.

Furthermore, storage ripening requires from two to six times the equipment of storage vats or cans, a wasteful area of storage space, and a heavy increase of refrigeration. The characteristic flavor and aroma of fresh dairy products are lost, and all manner of fermentations

[1]Reid and Scism, Mo. Research Bull. 82, 1925.

and "off" flavors can develop during the prolonged storage period. It is about the most inefficient remnant of past practices remaining to impede the progress of the industry.

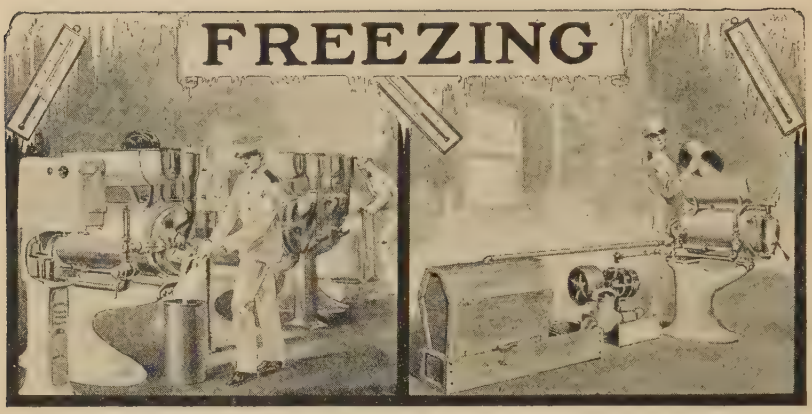
As soon as the mix is drawn from the cooler, add the solution of Meloine or Mello-Freeze. If it is cooled in a mixer or other container, be sure it is cooled to a temperature as near 40 degrees F. as the circumstances permit, before adding the Meloine or Mello-Freeze. Directions for the proper use of Meloine and Mello-Freeze are given on pages 69 to 73, and in simplified form on each can. Agitate thoroughly until the solution is perfectly and evenly distributed throughout the whole batch.

If the Meloine or Mello-Freeze is added in a storage vat or tank, draw the mix over directly from the cooler and do not let it become warmer first. Be sure the brine flow and temperature are such as to hold the batch at an even temperature of about 40 degrees for the necessary length of time.

If the Meloine or Mello-Freeze is added in cream cans or in packer cans, have them precooled. Add the solution promptly and immediately place the cans in a cooler that will keep the contents the required length of time, at an even temperature, as near 40 degrees as possible, or promptly place them in ice water to which ice must be added at intervals so as to maintain an even temperature of about 40 degrees during the brief ripening period.

Over-night ripening will then be ideal, providing the acidity of the mix is not over 0.21 per cent. and the temperature between 36 and 40 degrees F. Both higher acidity and higher temperature shorten the time.

Wherever the mix is held for ripening, there must be no foreign or offensive odors: even the use of milk-soured wash water and sour wash cloths can affect the Ice-Cream.



Modern Ice-Cream freezing is the operation, first, of incorporating in the mix the air necessary for dividing the moisture to such a degree of fineness that the formation of icy crystals will be prevented and, second, of reducing the temperature of the mix to a point where the air cells will be held in even distribution until the aerated mixture can be completely hardened.

ICE CREAM FREEZERS

The original method of freezing was, to pack a closed container in a mixture of salt and broken ice; remove it, from time to time, to scrape the frozen portion from the walls of the container with a spatula (a process known as spaddling); and so continue until the batch was frozen through. The "freezer load" was rarely more than about one quart.

The first improvement was a contrivance for scraping the interior by rotary motion, while holding the tub between the knees, after the manner of the old family coffee mill. As late as 1844 a London manufacturer advertised such "ice machines" of one-quart capacity. The European clung to his Ices and prepared them in homeopathic doses. In America, where Ice-Cream was preferred even then, commercial necessity had enlarged the "Ice-Cream machine" for power production, but the tub persisted until artificial refrigeration developed the present-day brine refrigerated freezer.

Tub freezers, both hand and power driven, are still in use in small operations up to ten gallons capacity. When using them the frozen

product must be transferred to packer cans for hardening. This may be done by scooping it over in specially designed scoops or ladles, or by pouring sufficient cold water over the sides of the freezer can to loosen the contents and wash off the outside, and then dumping the frozen mix into the hardening can. The first method is messy and inefficient while the other is apt to cause icy crystals. Where tub freezers still survive, they are sometimes used for making ices, sherbets and fancy Ice-Creams. The hardening is accomplished by means of salt and crushed ice in tubs. It is difficult to regulate swell in a tub freezer.

Vertical brine freezers have advantages claimed for them; but they have the serious fault that swell is difficult to regulate in them, owing to the weight of the mix bearing down on the lower portion.

The continuous disk freezer was attractive in theory; but it was criticized almost from the first[1] on the ground that it is difficult to operate in such a manner as to incorporate air with the mix properly. It is apt to cause a foamy consistency which makes a coarse, fluffy Ice-Cream, and for this reason it is almost entirely displaced by the horizontal batch freezer.

Horizontal brine freezers represent the highest perfection of modern Ice-Cream freezing. There are many makes with as many refinements of design and construction, and most of them give satisfaction. Still there are certain virtues the buyer should look for if later regrets are to be avoided.

The freezer should be large enough to admit of the full swell above the rated capacity. The actual capacity, with dasher in place, should be at least one-fifth greater than the rated capacity.

The scraper blades of the dasher must be true and lie smooth against the cylinder, and must not have a rounded or turned scraping edge. The dasher shaft and other bearings must fit snugly without danger of binding. The freezer interior and all parts coming in contact with the mix must be heavily tinned unless the metal is such as will not be attacked by fruit acids. The construction must admit of convenient removal of the dasher and give easy access to all parts for cleaning. The interior must be smooth and so set as to drain clean. The brine thermometer and power control must be convenient to the operator at the head of the freezer. The brine flow should be ample. An automatic batch measure or weighing device in the hopper, is a useful adjunct. The freezer must be so constructed that the entire load can, at the proper stage of the swell, be promptly and entirely drawn into packer cans, or brick boxes in the minimum of time, in order that the consistency of the frozen mix may be the same from first to last.

The size of commercial horizontal freezers ranges from 40-quart to 120-quart rated capacity. The small operator uses the 40-quart size

[1]Prof. A. C. Baer, Ice-Cr. Rev., Aug. 1923.

until his sales equal the output of five or six such freezers. For a greater output, the larger machines can be used profitably; but even then some of the smaller will be used for the freezing of remnant mix, for filling small cans, for brick trade, for ices, sherbets and fancy Ice-Creams, and for slack seasons.

The power required by a 40-quart freezer is at least a 3 h.p. motor, and even that, with a 5-gallon mix, will have an overload during about four minutes of the operation for each batch. The highest load developed for a brief period is about 4 1-3 h.p. just before drawing.[1] Obviously a 2 h.p. motor would strain and slow down at the critical time when everything should function perfectly.

HOW TO MANAGE THE OPERATION OF FREEZING

The careful calculation and exact compounding of the mix, the processing in accord with scientific requirements, and the perfectly controlled ripening and mellowing, all culminate in the freezing operation. This can now be almost perfectly controlled, producing profitably the most universally relished food and confection the ingenuity of man has yet invented.

The man who operates a freezer holds the purse strings and can waste or conserve the profits at a rate that may easily break or make a concern. He must thoroughly understand his machine and the theory and practice of freezing the Ice-Cream mix, so as to respond instantly to every changing factor. He should familiarize himself with every line of the chapter on Freezing, in order to freeze smoothly and with uniform swell. Practice and an observing eye will overcome all difficulties. Successive batches are apt to respond to control differently, even though their composition seems identical. Therefore the attendant must watch, with even greater vigilance, the first few freezer loads of a new run.

An accurate thermometer is a necessity at every step of Ice-Cream making. A standardized thermometer is one that has been tested at various temperatures and either found correct or the corrections are stated on an accompanying certificate. Such thermometers are too costly to distribute about the plant indiscriminately; but there should be one in every Ice-Cream factory that the cheaper instruments in actual use may be compared with it, with particular attention to that specific range of temperature which is in question in each case. The freezer operator must have one that is dependable between 10 and 50 degrees above zero F. This is, of course, in addition to the fixed brine thermometer.

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[1] F. B. Fulmer, in Ice-Cre. Rev., Oct. 15, 1923.

The brine temperature, like every thing about Ice-Cream making, is relative and depends almost entirely upon the proportion of sugar in the mix; the more sugar, the more refrigeration is required to freeze it. The following table, based on the standards outlined in the table on page 17, shows the approximate temperature of brine that will satisfactorily freeze ices, sherbets and Ice-Creams.

Suggested Brine Temperature

for Freezing the Correctly Standardized Mix, and **Composition of Brine** when Made of Salt and Cracked Ice.

Calculated on Basis of Brine being Discharged from Freezer 3½ degrees Warmer than at Inflow[1].

Butter-fat standard	Temperature (degrees F.)	With salt at 60 degrees F.				With salt at 50 degrees F., per cent salt	With salt at 40 degrees F., per cent salt
		100-lb. mixture		Ice used per pound of salt (lbs.)	Salt used per pound of ice (lbs.)		
		Salt (lbs.)	Ice (lbs.)				
0 (Ices and sherbets)	—2.4	23.46	76.54	3.26	0.307	23.01	22.58
2.40	—1.9	23.22	76.78	3.31	0.303	22.78	22.35
3.50	—1.2	22.89	77.11	3.37	0.297	22.46	22.04
4	—0.8	22.70	77.30	3.41	0.294	22.27	21.85
5	Zero	22.32	77.68	3.48	0.288	21.89	21.48
6	0.8	21.94	78.06	3.56	0.282	21.52	21.12
7	1.6	21.53	78.47	3.64	0.275	21.14	20.73
8	2.4	21.07	78.93	3.75	0.267	20.68	20.30
9	3.2	20.61	79.39	3.85	0.260	20.23	19.86
10	4	20.16	79.84	3.96	0.253	19.79	19.43
11	4.8	19.70	80.30	4.08	0.246	19.34	18.99
12	5.6	19.24	80.76	4.20	0.239	18.89	18.55
13	6.4	18.78	81.22	4.32	0.232	18.44	18.11
14	7.2	18.32	81.68	4.46	0.225	17.99	17.67
15	8	17.86	82.14	4.59	0.218	17.54	17.23
16	8.8	17.40	82.60	4.75	0.211	17.09	16.79
17	9.6	16.94	83.06	4.90	0.204	16.64	16.35
18	10.4	16.49	83.51	5.06	0.198	16.19	15.91
19	11.2	16.01	83.99	5.24	0.191	15.73	15.46
20	12	15.50	84.50	5.45	0.184	15.23	14.96

Lower temperatures can be maintained for any or all of the standards, but the freezing and drawing temperatures must be carried correspondingly lower. No time is gained by it.

[1]Based on determinations of John T. Bowen, technologist, U. S. Dept. of Agr., Dept. Bul. 98.

First test the mix for temperature, largely as a check on the work that has gone before, for it is better to use it as it comes and regulate the freezing temperature accordingly. About 38 to 42 degrees F., which is a good ripening temperature, is best at entry into the freezer. When the mixture is drawn from the cans or storage vats it must be stirred up periodically, unless a power agitator keeps it in motion: otherwise, part of the Ice-Cream may be above standard and part of it below, if not properly homogenized.

Start the Freezer. The speed varies with the different machines and the operator must be governed, in the main, by the instructions of the maker. The speed must be high enough to whip the mix properly without churning it into butter. If the dasher turns at too low a speed, raise the temperature or the yield will be either lowered or require longer time to incorporate the necessary swell. Increasing the dasher speed, at a given temperature, increases the swell: lowering the brine temperature, at a given dasher speed, lowers the swell. A fair average speed is about as follows:

Average Speed of the Dasher

Style of Freezer	Revolutions per Minute
Horizontal, brine or ammonia	174
Vertical, brine	215
Tub (40 qt.)	133

This is for a mix containing 8 to 12 per cent. butter fat. A richer mix may require a lower speed, to prevent buttering, unless it is homogenized. A leaner mix may be able to use a higher speed. The tub freezer cannot be closed as tightly as the others and therefore requires the low speed indicated to avoid loss by splashing.

If the temperature of the mix is not below 45 degrees F., especially if it is not homogenized or viscolized, turn slowly till it drops below 40, to prevent buttering. This is more important in warm weather and particularly in spring. As soon as the mix is cooled, the speed of the dasher can be increased to normal. The dasher speed does not directly affect the length of time required for freezing; it serves only to incorporate the air, flavor, color, fruit, nuts or confections, and to scrape the cylinder clean of frozen mix.

Then open the brine valve and the hopper valve at the same time. The flow of brine should be at such a rate that it leaves the freezer 3 or 4 degrees warmer than when it entered. Then fill the freezer half full, for the best results; but do not put in so much mix that there will not be room enough for the standard swell. Filling the freezer more than half full prevents proper swell, especially if it contains 12 per cent. butter-fat or more. According to the temperature of the brine, the mix is cooled more or less rapidly to about 27 degrees F.

Shut off the brine in three to four minutes after the mix has entered the freezer, when the mix will have neared the end of the initial big drop in temperature. It will then go down more slowly another degree, whereupon there is a slow return to 27 while the latent or reserve heat is extracted, so that the mix can be frozen. During this second period the dasher beats the necessary air into it. Let it continue to do so until the top swell is reached. If the initial big temperature drop takes longer than four minutes, then keep the brine shut off a correspondingly shorter time. Watch the dasher speed when the mix stiffens: a loose belt or a weak motor may cause loss of necessary speed and consequently loss of swell.

This is the stage when fruits, fruit juices, nuts or confections should be added, if the style of product requires any of them. Should they be added sooner, it would interfere with the proper swell and the fruits or confections would be unnecessarily mashed.

Shut off the brine just before drawing or so regulate the flow that the swell remains as nearly constant or unchanged as possible until the last of the batch leaves the freezer gate. Increasing the flow of brine lowers the temperature of the product and, at this stage, breaks down the swell: decreasing the flow checks the breaking down. Continued freezing reduces the size of the aircells; but that has no effect on the texture,[1] though it does enable the product to "stand up" better.

At the correct swell, the thicker the frozen mix, the smoother the product and the less the subsequent shrinkage. Properly drawn, it has passed the soft, glossy stage and assumed the consistency of thick gravy of dull appearance, folding on itself like ribbon as it flows into the packer can or brick box. Drawing too soft causes air holes in the packer, which collapse later, and this results in coarse Ice-Cream and shrinkage. To obtain uniform results, use the thermometer and the tester industriously, note the appearance of the product when drawn at the correct stage, and so learn in time to draw by eye. However, few become as reliable in their estimate as the scale or tester. It is a matter of profit and loss, as well as stability, and deserves all the effort that absolute certainty requires.

Draw into cans or brick boxes that have been precooled to the temperature of the frozen product at drawing: otherwise there will be meltage and icy crystals will result during the hardening process. Draw without delays between cans as the swell may be radically different between the first canful and the last if not closely watched. Stay at your post and let another promptly cover them and take them away for hardening.

Hoppers to convey the frozen Ice-Cream to packer cans and brick machines on a lower floor, are a convenience but also a possible source of trouble, unless the product can be kept running without interruption.

[1]Prof. A. C. Dahlberg, convention, N. Y. Ice-Cr. Mfrs. Assn., Buffalo, 1925.

If a can is only partly filled, don't let it stand warming and melting until the flow resumes. It would be better to pour it at once into another can that may be in process of filling under another chute, and then clean and dry it before using it again. Unless these things are promptly and carefully done, icy crystals will surely result.

The entire time in the freezer need not take over 11 to 14 minutes. This admits easily of four freezer loads per hour, which is standard practice in modern plants. Ices and sherbets require 20 to 25 minutes. Variations in the time consumed for any class of product may be due to temperature of brine, to rate of flow of the brine, to variations from the standards of composition outlined on page 17, to variations in homogenizer pressure, to improper ripening as distinguished from souring or aging, to variation of freezer loads, to the condition of the dasher-blade edges, and finally to the operator of the freezer.

Freezers and conveyor pipes need not be cleaned between loads if the batches follow in immediate succession. But for all rest periods and at the end of a day's run, they must be rinsed, taken apart for scrubbing with Tru-White Washing Powder, rinsed again, scalded with boiling water or, better yet, sterilized with live steam, and finally wiped dry with clean cloths. Cylinder head and hopper cover should be left ajar, with clean white cloths hung over the openings. After longer periods of idleness, the freezer, hopper and pipes should again be scalded or steamed and drained before using.

Packer cans and brick forms should be treated in like manner: otherwise icy crystals may result.

TESTING THE OVERRUN

The swell must be carefully controlled for uniformity. Those who run by guess or appearance of mix as drawn, may be able to strike an average for the day's run somewhere near the correct total; but individual cans may easily vary fully 50 per cent. If 90 per cent. is the swell aimed or guessed at, it is by no means uncommon to have one can or one freezer load turned out at 60 per cent. swell while another may have as much as 100 or more. Such results will not be apt to build up a business, no matter how costly or extravagant the mix.

There are three ways of testing the swell: first, with an overrun tester; second, with a platform scale calibrated to one-hundredth pound; and third, with a spring scale having a dial calibrated to one-eighth ounce or less.

Overrun testers of convenient design and tidy appearance are made by several manufacturers.

A scale calibrated to one-hundredth pound would have many uses in standardizing a mix on the percentage basis. Swell can be accurately controlled with it, if the formulas in this book are faithfully adhered to. The next to the last column of the table on page 17 gives the

correct weight of the frozen mix at drawing. Place a clean, pre-cooled half-pint measure on the scale and weigh it (empty) on one beam. Then draw it level full and quickly weigh the contents on the other beam. The net weight should be one-sixteenth the weight of the finished Ice-Cream as given in the table. If the first test is not near enough to suit, pour the contents back through the fruit funnel and clean, dry and cool the measure for further tests until satisfied. Then promptly draw into precooled packing cans that are ready at hand.

An emergency overrun tester can be improvised by simply changing the readings on the dial of an accurate, small spring scale to read in reverse. Provide a postal scale calibrated, on a dial, to show ¼ ounce or less. Provide also a cup or measure which holds exactly 4 ounces unwhipped mix when level full.

Turn the thumb screw of the scale so that the indicator or pointer will show exactly 0 when the empty cup is on the scale. Then paste a good quality of writing paper over the dial: it should be light enough to show the marginal graduations of the dial through the paper. Mark over these with a waterproof India ink (to be obtained at a stationer's shop), all the marginal lines up to 4 ounces, but without marking the figures. Opposite the 4-ounce line, mark the figure, "0"; opposite the 3-ounce line, mark "50%"; opposite the 2-ounce line, "100%"; opposite the 1-ounce line, mark "150%". The graduations between these will, if they represent ¼ ounce each, be equivalent (from right to left) to 12½, 25, 37½, 50, 62½, 75, 87½, 100, 112½, 125, 137½, and 150 per cent. swell. If the scale registers smaller fractions of an ounce than ¼, the determinations can be made correspondingly more accurate.

To make a test, simply draw from the freezer to fill the pre-cooled cup or measure level full with the frozen mix, place it on the scale, conveniently at your side, and make the reading. Act quickly. If not satisfactory, clean, dry and cool the cup to test at intervals until satisfied. Then draw promptly, as rapidly as possible without causing air pockets in the packing cans or brick forms. A spatula or any straight piece of metal should be used to sweep off the surplus mix in the cup, making it exactly level full.

TOTAL SOLIDS AND SWELL

Loading Ice-Cream with excessive proportions of sugar, to gain solids for greater swell is an erroneous practice. Excessive total solids reduce swell, whatever ingredients predominate.

The swell is obtained from the milk solids, chiefly the serum solids, and even they have a limit above which the swell does not increase in the same proportion. The butter-fat contributes but little.

Excessive sugar lowers the freezing temperature, delays the swell, lessens the number of freezerloads drawn per hour, and so reduces the output or capacity of a plant with a given equipment. It cannot be

argued that freezing at the lower temperatures demanded by the sugar excess, produces a smoother Ice-Cream, as the thermal units are expended in extracting the moisture from the sugar excess.[1] The ill-balanced mix is hardened and kept hard at a lower temperature and softens in transit and in the cabinet at a temperature at which a correctly balanced Ice-Cream remains firm. As it softens it tends to shrink. It cannot be defended on the basis of public preference, for the experience of observing manufacturers has placed the popular requirement at 14 per cent. sugar for 8 per cent. Ice-Cream and 13 per cent. sugar for 14 per cent. Ice-Cream.

An excess of any ingredient whatever serves no good purpose, physically or economically, but it does reduce profit. A correctly balanced formula is balanced in the elements of a perfect food, yields all that the best interests of the industry demand, and has all the body necessary for resistance and endurance.

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[1]Harper F. Zoller, convention, Am. Soc. Refrig. Eng., Cleveland, 1924.

HARDENING

Ice-Cream hardening is the operation of lowering the temperature of the soft frozen mix and holding it at such a low degree that the air cells and solids in the mix will remain fixed in a state of perfect emulsion until the product is marketed. Quick hardening (that is, hardening at a low temperature) tends to make smaller crystals and smooth product: slow hardening (that is, hardening at a high temperature) tends to make large crystals and coarse Ice-Cream and, especially with excessive overrun, may easily result in collapsed centers.

The hardening temperature varies between 10 degrees above zero F. and 15 degrees below. It depends on the facilities or equipment of the plant, on the radius of distribution, and on the atmospheric temperature with which the Ice-Cream is surrounded after it leaves the plant. It must be delivered to the retailer cold enough to admit of dispensing it before it softens. If it is not dispensed on the premises, it must be hardened at a temperature so low as to allow for such warming influences as it will be subjected to and still deliver the product below the softening point.

Ice-Cream softens at 12 to 15 degrees F., owing to the presence of sugar in varying proportions, and begins within that range of temperature to lose its stability, though visible melting is not evident until the melting point of ice is reached. If it is to be served on the premises, without delay, a reserve cold of 2 degrees F. may prove sufficient. In that case, hardening at 8 to 10 degrees above zero F. may be attempted. In winter that may be cold enough even for local delivery in the northern states. However, slow hardening (that is, hardening at a temperature above zero F.) requires the use of a perfectly balanced formula and correct methods, to avoid various difficulties. A high-grade gelatin should be used when hardening at a temperature above zero: otherwise, the heavier solids may settle to the bottom.

For local delivery, hardening at 5 degrees F. allows from 7 to 10 degrees rise in hauling and delivering and in dispensing from the retailers' cabinet, which is reasonably safe, especially in winter. Nevertheless, the Ice-Cream maker who is equipped for hardening at zero F. or lower will serve his own interests better by not hardening at a higher temperature.

For suburban or country delivery, hardening at zero F. allows from 12 to 15 degrees rise before the danger point is reached. On rough roads and long hauls this is none too much, especially since the Ice-Cream is apt to be held longer, and that too in cabinets not held at a uniformly low temperature. At zero or lower, the frozen mix can be hardened in 8 to 12 hours, insuring a smoother and better product.

For express shipments, hardening at 1 to 3 degrees below zero F. may allow a safe margin under favorable circumstances and conditions; but the careful Ice-Cream maker will provide even greater margin of safety in warm weather, particularly where special care is not assured. On long hauls and for express shipment, snugly fitting tight canvas covers should always be provided to minimize meltage, and consignee should co-operate by promptly repacking on arrival.

Ices and Sherbets should be hardened 5 to 8 degrees lower for each of the above purposes. With the use of "Snow," even express shipments of Ices and Sherbets are then feasible. With reasonable care, they should then stand up like Ice-Cream, in which case there will not be a sticky mass of sirup, color and flavor in the bottom of the can.

There are three general ways of hardening: first, by packing the cans containing bulk or brick Ice-Cream in a mixture of ice and salt; second, by placing the Ice-Cream packer cans in artificially cooled brine; and third, by placing the cans and bricks in special cold rooms for dry hardening.

Hardening in a mixture of ice and salt is distinctly for the smaller business. It may be accomplished directly in the tub freezer where only one freezer load is made. If a tub freezer is used for freezing more than one batch, raise the freezer can from the tub, pour cold water over it to rinse off the salt and to loosen the frozen mix from cylinder, and then dump the contents into a pre-cooled, clean can for hardening. The frozen mix in the packer cans may be hardened either in insulated, steel lined boxes, as shown in the title illustration, or in packing tubs. Pack cracked ice and coarse salt 6 inches thick around the cans and 6 inches deep over the securely covered tops. Mix the salt with the upper third of the ice, as it will work its way down when the ice melts. Provide the hardening box and the tubs with a drain at the bottom to draw off the brine, and refill the upper part with ice and salt mixture in proper proportion after the first 6 or 8 hours and, thereafter, twice a day. The mixture must be well tamped down to fill all voids, as far as possible. A metal tamping rod or a broom stick will serve the purpose.

The proportion of ice and salt required to produce various temperatures is shown in the following table.

Salt and Ice Pack

For Tub Freezing, Box Hardening, Tub Hardening, and Tub Shipping.

Desired temperature (degrees F.)	With salt at 60 degrees F.[1]				With salt at 50 degrees F. (per cent. salt)	With salt at 40 degrees F. (per cent. salt)
	100-lb. mixture		Ice used per pound of salt (lbs.)	Salt used per pound of ice (lbs.)		
	Salt (lbs.)	Ice (lbs.)				
12	15.12	84.88	5.61	0.178	14.86	14.61
11	15.74	84.26	5.35	0.187	15.47	15.21
10	16.22	83.78	5.16	0.194	16.01	15.74
9	16.86	83.14	4.99	0.203	16.60	16.29
8	17.41	82.59	4.74	0.211	17.11	16.82
7	17.97	82.03	4.57	0.219	17.65	17.34
6	18.53	81.47	4.40	0.227	18.20	17.83
5	19.09	80.91	4.24	0.236	18.75	18.41
4	19.65	80.35	4.09	0.245	19.29	18.95
3	20.20	79.8	3.95	0.254	19.84	19.48
2	20.79	79.21	3.81	0.263	20.41	20.04
1	21.28	78.72	3.70	0.271	20.89	20.51
Zero	21.74	78.26	3.60	0.278	21.34	20.95
—1	22.21	77.79	3.50	0.286	21.79	21.39
—2	22.67	77.33	3.41	0.294	22.25	21.84
—3	23.11	76.89	3.33	0.301	22.70	22.28
—4	23.60	76.4	3.23	0.309	23.16	22.73
—5	24.06	75.94	3.11	0.314	23.61	23.17
—6	24.53	75.47	3.08	0.326	24.06	23.61
—7	24.99	75.01	3.00	0.334	24.51	24.05
—8	25.46	74.56	2.93	0.342	24.97	24.50
—9	25.93	74.07	2.86	0.35	25.42	24.94
—10	26.39	73.61	2.79	0.359	25.88	25.38

Many factors cause the temperature to rise in the tub.

First.—A tub for a 20-quart can packed with ordinary care contains more than 394 cubic inches of air space, approximately 17.7 per cent. of the total space between the can and the inside of the tub. In cooling the air that fills these spaces from, say, room temperature (68 degrees F.) to zero, 4.53 B.T.U. of heat must be absorbed by the freezing mixture and thereafter there is a constant demand on the freezing mixture for work in keeping this air down to the temperature.

Second.—The sides of the tub act as a conductor of heat from the outside air into the tub, and, of course, the freezing mixture has to cool

[1]Salt with a higher temperature than 60 degrees F. may be calculated as of 60 degrees.

it. The outer surface of a tub for a 20-quart can measures more than 8.65 square feet, every square inch of it a heat conductor. It is not practical to give average figures for this loss, because the quantity of heat it will transmit varies with conditions. The kind of wood of which it is made is important. In its heat conductivity ash, for instance, is to oak as 3.6 is to 5.01. Heat conductivity is the flow of heat (or cold) through woods or other mediums, and is measured by British thermal units (B.T.U.). Whether the staves run with the grain or, to a greater or less extent, cut across it, is an important consideration. Where the staves run with the grain, the heat conductivity is, in the case of ash, 9.5 to 27 for staves cut across the fibre. Intermediate differences exist where the length of the staves is neither parallel nor at right angle to the fibre, but cuts it diagonally. A relatively dry tub will transmit more heat than one that is well soaked and very damp. Many other conditions vary the quantity of heat from the outside air thus to be taken care of. The outside temperature, of course, varies and may be modified by surroundings such as another tub of ice nearby.

Third.—The bottom of the tub is another heat conductor. It is protected by whatever it rests on and does not transmit proportionally as much heat as the sides, but its 169 square inches of surface receive and transmit considerable heat.

Fourth.—The top is a most effective waster of cold. It should be kept covered with burlap or canvas. The ready-to-fit-and-tie tub covers offered in heavy canvas are a good investment. The dry-pack shippers give satisfaction in express hauls up to 5 hours' duration, providing some 15 degrees reserve cold was allowed in hardening. They save much in express costs. When the tub is uncovered, it exposes 225 square inches of surface to the action of heated air. The air in contact with the top of the contents of the tub must be cooled to very nearly the temperature of the salt-and-ice mixture. The adjacent air, for an indefinite distance, is cooled to a constantly decreasing degree of convection: that is, the generation of heat currents. In the course of 24 hours, many cubic feet of air reaching the inside of the tub or coming in contact with its top must be thus cooled.

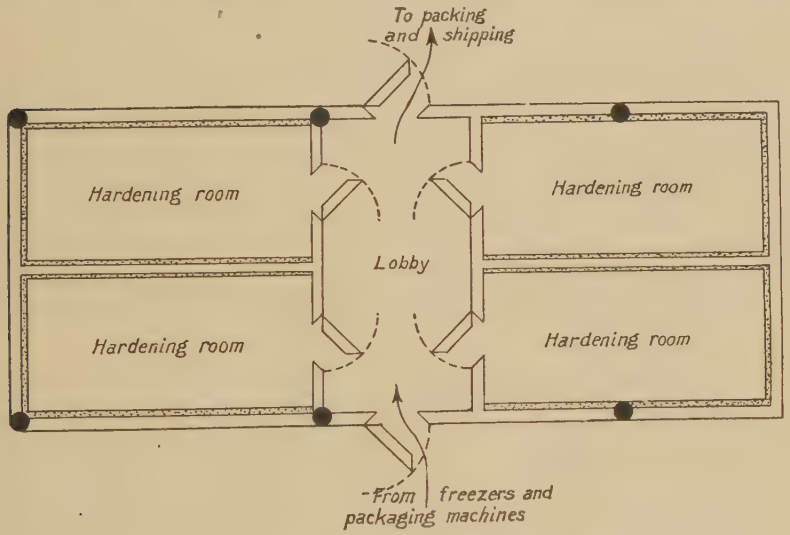
There are other factors, such as the humidity in the air which fills the voids, and the extraction of the latent heat remaining in the frozen mix; but the above are the more important causes of the wastefulness of hardening by means of the salt and ice pack. They suggest their own remedies and safeguards.

Hardening in a brine box involves the maintenance of a mechanical refrigerating plant. It avoids the mess and unsteadiness of ice-and-salt hardening by placing the packer cans in brine. This is cooled mechanically and kept in motion by pumping.

Dry-Hardening in insulated hardening rooms is of two kinds, still-air and air-blast. The still-air hardening room is usually built with an

aisle through the center, the refrigerating coils forming the shelves on which both bulk and brick Ice-Creams are hardened, preferably at a temperature of 10 to 15 degrees below zero F. The air-blast system usually has the coils in an overhead bunker, fans circulating the air, from end to end, between cans that are stacked without an aisle but with an inch of space between cans through the length of the room. The air-blast method is more efficient, hardening at a temperature perhaps 10 degrees higher in the same length of time consumed in still-air hardening. And yet the air-blast method is unpopular, possibly because so many factors must be watched—distribution of air current, correct stacking of packer cans, and refrigeration temperature.

Factories are usually built with supporting posts at regular intervals of 16 feet, forming "bays" or squares which should govern all divisions of space for convenient and efficient work. Thus the hardening rooms should be built in definite units, beginning with half bays, capable of multiplication at low cost. The following diagram illustrates the idea.



HARDENING ROOMS ADAPTED TO BUILDING PLANS

Efficient management demands several small rooms rather than one or two large rooms. This admits of separating the product of different ages; admits of lowering the temperature in any unit for holding after hardening, and that without the labor of transferring; admits of filling any room or withdrawing from it without subjecting other stock to change of temperature; provides cooling space in emergencies for milk and cream, either in the hardening rooms or in the lobbies. The capacity of a hardening room, 8 ft. wide and 8 ft. high, with shelves on both sides of an aisle, is 100 gallons per lineal foot, or 1600 gallons when 16 feet long. These are the proportions of the above diagram. The black dots represent structural posts or pillars of the building: whether

the bays between them are larger or smaller, the proportions of hardening rooms and lobbies should be adapted to them.

SANDY ICE-CREAM

Sandiness in Ice-Cream is a serious and not uncommon fault. It often makes Ice-Cream unmarketable and thus causes considerable loss. It may be described as the presence in Ice-Cream of hard particles, feeling like sand, which grit between the teeth when the Ice-Cream is eaten and do not readily dissolve in the mouth. It should not be confused with ordinary roughness or with icy crystals. Ice crystals are due to faulty method, usually drawing from the freezer before the latent heat is completely extracted, or alternate melting and refreezing, at some stage of manufacture, storage or distribution. Sandy crystals are, as a rule, primarily due to improper balance of ingredients: that is, to faulty formulas.

The cause of sandy ice cream is the crystallization of lactose or milk sugar. The hard particles are lactose crystals. They vary in size, and are sometimes so small that they will pass through filtering paper. The small crystals dissolve three times as readily as the large. If very small and not too numerous, they may pass unnoticed, but if there are many of them, however fine, they make the Ice-Cream unpalatable. The large crystals have sharp edges, and whether few or many, they render Ice-Cream unfit for use. Both forms of crystallization—ice and lactose —can be avoided by following the formulas and methods advocated in this book.

Sandiness first became evident, when, with the introduction of condensed and powdered milks as material for Ice-Cream, the percentage of milk-solids-not-fat or serum solids in the mix was increased.

Fifty-four per cent. of milk-solids-not-fat is lactose. A surplus of lactose above the quantity which the available moisture in the mix can hold in solution is the principal cause of sandiness, especially when it develops in the hardening room. Various conditions contribute or tend to inhibit or retard lactose crystallization and some of them will cause sandiness even when there is not an excessive amount of lactose in the mix. With even so small a quantity of milk solids as 6 per cent., which would give 3.24 per cent. lactose measured on the entire mix, sandiness has resulted in four days in a cabinet subject to heat shock.[1]

Lactose occurs in three forms, known as alpha-hydrate, alpha-anhydride and beta-anhydride. The hydrate differs from alpha-anhydride in that it contains one molecule of water not in the latter. It is this form of lactose which crystallizes out and causes sandiness. Beta-anhydride is the hydrate plus one-half molecule of water. When hydrate lactose is added to water a part of it begins at once to be transformed into the beta-anhydride and this transformation continues until the two

[1]Dr. Owen E. Williams, "Progress in Studying Causes of Sandy Ice-Cream," Convention, Natl. Assn. of Ice-Cr. Mfrs., Oct., 1921.

are in equilibrium: that is, so balanced that there is no further tendency to a change of form.

At 32 degrees F. equilibrium is reached when there is 1 part of hydrate to 1½ parts of beta-anhydride. These proportions vary slightly at different temperatures until, at 199.4 degrees F. and above, hydrate lactose is entirely converted into beta-anhydride.[1]

Equilibrium once established does not change with change of temperature.[2]

Seven rules governing the solubility of lactose, most of them also applicable to other crystallizable substances, have a direct bearing on the formation of lactose crystals:

I. Lactose, when added to water, has an initial solubility, which is practically instantaneous, and a final solubility reached only after the lapse of many hours.[1] [2] In other words, as soon as lactose is put into water, a portion of it dissolves and at once combines with the water: this constitutes initial solubility. More lactose gradually combines with the water, at constantly decreasing rate of speed, until all the lactose that can possibly be united with the water, at that temperature, has combined: this constitutes final solubility and makes a saturated solution.

II. Both initial and final solubility vary with the temperature. The quantity of lactose which may be put into solution decreases as the temperature is lowered. [1] [2]

III. Between the point of initial and final solubility, known as the metastable area, crystallization takes place spontaneously only if there is a "seed" present consisting either of a lactose crystal or of a crystal of some isomorphous substance: that is, a substance having crystals, identical or nearly identical in form.[1] [2]

IV. Beyond the curve of final solubility is a curve of super-saturation. Between these two curves is an area called labile, where a solution, too dense to be there made, can be held in solution. In this area, in the absence of "seeds" and of heat shock or mechanical shock, lactose will remain uncrystallized for periods varying with temperature and concentration. There it will however, in time, crystallize without seeding, and that time is greatly lessened by heat shock and to a less degree by mechanical shock.[4] [5]

V. There is a point, varying with concentration, where, as the temperature is lowered, crystallization is stopped and, as the lowering of the temperature continues, crystals disappear and the mix attains a fineness not found at higher temperatures. [3] [4] [6] [7]

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[1]S. C. Hudson, "Hydration of Milk Sugar in Solution," Journ. Amer. Chem. Soc., Vol. 26, page 1065.
[2]S. C. Hudson, "Sugar Crystals," Journ. Amer. Chem. Soc., vol. 30, pg. 1767.
[3]H. A. Miers and Miss F. Isaac, "Refractive Indices of Crystallizing Solutions," Journ. Chme. Soc., vol. 89, p. 413.
[4]Hallimond, Journ. Iron & Steel Inst., vol. 105, p. 359.
[5]Leighton & Peter, "Factors Influencing Crystallization of Lactose," World's Dairy Congress, Syracuse, 1923.
[6]Ostwald Zeitsch. für Physik. Chem., Vol. 22, p. 289.
[7]Harper F. Zoller, Convention, Amer. Soc. of Refrig. Eng., Cleveland, May 1924.

VI. Alkali and, to a much less extent, acid in a solution hasten final solubility of lactose and quicken crystallization when once it has begun.[1] The acidity usually found in an Ice-Cream mix is too small to have this effect.[2]

VII. The formation of lactic acid in an Ice-Cream mix decreases the amount of lactose present by 95 per cent. of the weight of the acid, and lowers the temperature at which the lactose in the mix will be in saturated solution.

The solubility of lactose has been determined by competent investigators.[1] [3] [4] The results obtained are shown in the following table based on Hudson's data. The limit of supersaturation is also given as calculated from a curve deduced by Leighton and Peters.[5]

Solubility of Lactose

At and above 32 degrees F.

Temperature (degrees F.)	Per cent. lactose held in initial solution	Per cent. lactose held in final solution	Calculated per cent. lactose in super-solution	Temperature (degrees F.)	Per cent. lactose held in initial solution	Per cent. lactose held in final solution	Calculated per cent. lactose in super-solution
32	4.7	10.6	17	120.2	15.1	29.8	47.7
59	6.6	14.5	23.3	147.2	20.7	39.7	
77	7.9	17.8	28.5	165.2	25.6	46.3	
102.2	11.1	24.0	38.4	192.2	35.8	58.2	

Determinations of solubility have been made for higher temperatures than are given in above table, but none for lower than 32 degrees F. The table is valuable in this connection in affording a basis for determining the solubility of lactose at freezing and hardening temperatures.

Extrapolating figures for temperatures below 32 degrees F. by calculations based on projection downward of the curve of final solubility, obtained by charting the results shown in the above table, we get the following saturation ratios:

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[1]Hudson, Jour. Amer. Chem. Soc., Vol. 26, p. 1065; vol. 30, p. 1767.

[2]Chester D. Dahle, "Have We Solved the Sandy Ice-Cream Problem?" World's Dairy Congress, Syracuse, 1923.

[3]A. Smits and J. Gillis, Proceedings Acad. Sciences, Amsterdam, vol. 20, pages 520, 573.

[4]E. Saillard, Chemie et Industrie, vol. 2, p. 1035.

[5]Allan Leighton and P. N. Peters; "Factors Influencing Crystallization of Lactose", World's Dairy Congr., Syracuse, 1923.

Solubility of Lactose

Below 32 degrees F.

Temperature (degrees F.)	Calculated per cent. of lactose in saturated solution	Temperature (degrees F.)	Calculated per cent. of lactose in saturated solution	Temperature (degrees F.)	Calculated per cent. of lactose in saturated solution	Temperature (degrees F.)	Calculated percent. of lactose in saturated solution
31	10.46	18	8.96	5	8.19	—8	7.76
30	10.33	17	8.88	4	8.15	—9	7.74
29	10.10	16	8.81	3	8.10	—10	7.72
28	9.97	15	8.74	2	8.06	—11	7.71
27	9.85	14	8.68	1	8.02	—12	7.69
26	9.74	13	8.61	0	7.99	—13	7.68
25	9.63	12	8.55	—1	7.95	—14	7.67
24	9.52	11	8.50	—2	7.92	—15	7.66
23	9.41	10	8.44	—3	7.89	—16	7.658
22	9.32	9	8.39	—4	7.86	—17	7.656
21	9.21	8	8.33	—5	7.83	—18	7.655
20	9.12	7	8.28	—6	7.80	—19	7.65
19	9.04	6	8.24	—7	7.78	—20	7.66

Note that, at —20 degrees F., the solubility of lactose increases. This is the point at which crystals cease to form and their dissolution begins.

Calculating the percentage of lactose in supersolution below 32 degrees F. in the same manner in which the above table was calculated (viz.: by continuing the supersaturation curve downward) we get for 14 degrees, 13.51 per cent.; for —12 degrees, 10.86 per cent. and for —37 degrees, 11.42 per cent. This clearly shows that the lactose in every standard formula (based on the table on age 17) never passes beyond the supersaturation area, however much the mix may be supercooled, and therefore never of itself crystallizes out.

The per cent. of lactose in standardized Ice-Cream mixes (made according to the table on page 17) is shown in the following table. It is shown without considering the effect of acidity, and also when there is 0.18, 0.20 and 0.22 per cent. acidity, with the lowest temperature at which that quantity of lactose would be in complete solution. This point does not, however, mark in any case the lowest temperature at which the mix may be held. It is a danger point, at which, if passed, the mix becomes supersaturated with lactose, and care must be exercised to avoid shock. Meloine and other colloids, and sugar, as well as the natural inertness of lactose, tend to hold lactose in solution and, in the absence of crystalline starters or shock, the temperature may safely be lowered almost without limit.

Lactose Content of Standard Mixes

With Saturation Point at Different Degrees of Acidity.

Without allowing for acidity				At 0.18% acidity of mix[1]			At 0.20% acidity of mix[1]			At 0.22% acidity of mix[1]		
Milk fat (per cent.)	Lactose content (per cent. entire mix)	Lactose content (per cent. in solution with moisture in mix)	Saturation point (degrees F.)	Lactose content as reduced by 0.18% acidity (per cent. in solution with moisture in mix)	Saturation point beyond which greater care is necessary (degrees F.)	Limit of super-saturation	Lactose content as reduced by 0.20% acidity (per cent. in solution with moisture in mix)	Saturation point beyond which greater care is necessary (degrees F.)	Limit of super-saturation	Lactose content as reduced by 0.22% acidity (per cent. solution with moisture in mix)	Saturation point beyond which greater care is necessary (degrees F.)	Limit of super-saturation
2.40	6.30	8.95	18	[2]			8.93	18		8.91	18	
3.50	6.18	8.86	17	[2]			8.83	17		8.79	17	
4	6.12	8.81	16	[2]			8.78	16		8.75	16	
5	6.00	8.72	15	[2]			8.69	15		8.66	14	
6	5.89	8.63	14	8.63	14		8.59	13		8.56	13	
7	5.77	8.53	12	8.52	12		8.49	11		8.46	11	
8	5-66	8.44	10	8.42	10		8.39	10		8.36	9	
9	5.54	8.34	9	8.32	8		8.29	8		8.26	7	
10	5.43	8.25	7	8.22	6		8.19	6		8.16	5	
11	5.31	8.14	4	8.11	4	NO LIMIT	8.08	3	NO LIMIT	8.05	2	NO LIMIT
12	5.19	8.04	2	8.00	1		7.97	1		7.94	—1	
13	5.09	7.94	—1	7.90	—2		7.86	—3		7.83	—4	
14	4.97	7.83	—4	7.79	—6		7.76	—7		7.72	—9	
15	4.85	7.72	—9	7.67	—12		7.63			7.60		
16.	4.74	7.62		7.55			7.52			7.49		
17	4.63	7.51	NO LIMIT	7.44	NO LIMIT		7.41	NO LIMIT		7.37	NO LIMIT	
18	4.51	7.40		7.32			7.29			7.26		
19	4.39	7.28		7.19			7.16			7.13		
20	4.28	7.16		7.07			7.04			7.00		

This illustrates how the decomposition of lactose by lactic acid bacteria reduces the proportion of lactose remaining, injuring the fresh milk flavor, but also slightly lessening the danger of sandiness.

In every one of the standard mixes (made according to table on page 17), as the above table shows, the lactose remains in saturated solution, if not abused by thermal or mechanical shock, indefinitely below the temperature at which the mix would be frozen and hardened. How

[1]In calculating lactose reduction by acidity, a deduction was made from the acidity for the normal acidity of milk products due to various phosphates (averaging for fresh milk 0.147 per cent. See table on page 23). The moisture content of the mix was taken as reduced by the water added to the lactose in forming the lactic acid (5% of its weight).

[2]Natural acidity of milk products in mix exceeds 0.18 per cent.

long an Ice-Cream may be held when it has become super-saturated with lactose by the lowering of temperature, cannot be positively stated, because conditions vary.

Lactose enters into final solution very slowly. It takes more than 72 hours for it to pass from initial to final solution at 32 degrees F.[1] It crystallizes out of solution just as slowly. But there must be a nucleus as the beginning of crystallization. It may, as the result of shock, produce this nucleus itself. With ordinary hardening temperature this nucleus may not appear during a period of many weeks if there is no shock.

Next in importance to the limitation of the milk-solids-not-fat and consequently of the lactose content, which is taken care of by using the formulas in this book, is the prevention of seeding by the introduction of lactose crystals. The principal sources of seed are concentrated milk products—condensed milk, evaporated milk, and powdered milk.

Whenever using any of these products pasteurize the mix at a temperature of 145 degrees F. for 30 minutes. Ordinarily that will dissolve any crystals that may have formed and thus render the mix free of seeds that could act as nuclei to start sandiness. Condensed milk may also be pre-heated (see directions, page 42), especially where the crystals in it are large, as these are three times as difficult to dissolve as the finer crystals. Some of the investigators who discourage pre-warming do so because they fear it may precipitate some of the salts in the milk as possible nuclei for crystallization. Experience demonstrates that the danger from this source is slight. Indeed, under proper hardening and packing conditions, where, as in our standardized mixes, the milk-solids-not-fat are so held down that the lactose is in solution when the mix is frozen, there is no such danger whatever. Lactose crystals, if they are present in the mix when it is frozen, always cause sand: precipitated salts are a remote danger at the worst.

Avoid condensed or evaporated milk of high concentration. It contains more crystals than that of lower concentration and it is more difficult to get rid of them. The condensed milk in the formulas in this book ranges from 2.15 to 1 for condensed whole milk to 3.15 to 1 for sweetened condensed skim milk. These are within the limits of safety. Do not use condensed milk of a higher concentration than 3.15 to 1. Even these are apt to be troublesome enough.

Owing to the higher degree of concentration of sweetened condensed milks, they are a more frequent source of danger than the other forms of condensed milk in common use. Crystallized lactose in them must be completely dissolved before any milk is taken from the container: otherwise, it is practically impossible to standardize a mix correctly with it. The manner of dissolving it is described on page 42. If accumulations

[1]Hudson, Jou'n. Amer. Chem. Sec., Vol. 26, p. 1065; vol. 30, p. 1767.

of such crystals were left in the bottom of the original containers, and not included in the mix, the flavor would be injured and the serum solids and total solids would be lowered.

Stir well and mix thoroughly all condensed milk before taking any of it from barrels or other containers. Lactose crystals fall to the bottom of the container while fat rises to the surface. If milk is taken out without first mixing, the portion last removed will contain a shortage of fat and an excess of lactose and cause sand, no matter what other precautions are taken.

Milk, as furnished by the cow, contains, on an average, 4.88 per cent. lactose (table page 23) or, if measured on the basis of the moisture in milk as in solution with it, 5.06 per cent. Natural milk has never been known to develop lactose crystals at any temperature. Ice-Cream, the milk solids in which were obtained from a good quality of evaporated milk, developed sandiness in four days under bad cabinet conditions, although the mix contained only 3.33 per cent. lactose or, calculating it as in solution with 65½ per cent. water present, 5.08 per cent.[1]

A natural solution is always more stable than one made artificially or reconstructed, as is done when condensed, evaporated or powdered milk is recombined with water or other liquid.

Therefore, an Ice-Cream mix which contains a large proportion of natural milk is not as likely to become sandy as one containing less. Formulas for each standard, in which the milk content is high, will be found among those on pages 124 to 192 and should, where available materials permit, be preferred to others.

Ice crystals may help to cause sandiness by reducing the water content of a mix and thus increasing concentration of lactose. They are the result of improper methods of freezing and handling and should never be present.

Heat shock, the raising and lowering of temperature in the hardening room and cabinet; the alternate melting and refreezing of the Ice-Cream, will cause lactose crystals even when the mix is as near scientific perfection as is possible.

Regulate temperature in the hardening room so that the variations will be slight. Follow the directions as to management of the hardening room on pages 223 to 228. Do not bang the packing cans about unnecessarily. Maintain an even temperature in transit and in the cabinet, well below the softening point, which is about 12 or 14 degrees F. Do not permit sudden or extreme fluctuations of temperature, and do not delay repacking until the Ice-Cream is soft. Observe these fundamentals, confine yourself to formulas in accord with the standards on page 17, and you may never experience the presence of sandiness in Ice-Cream.

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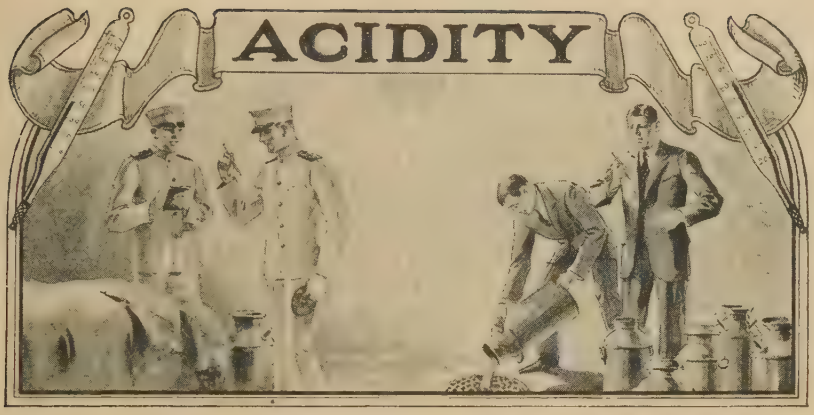
[1]Dr. Owen E. Williams, Convention, Natl. Assn. Ice-Cr. Mfrs., Minneapolis, 1921.



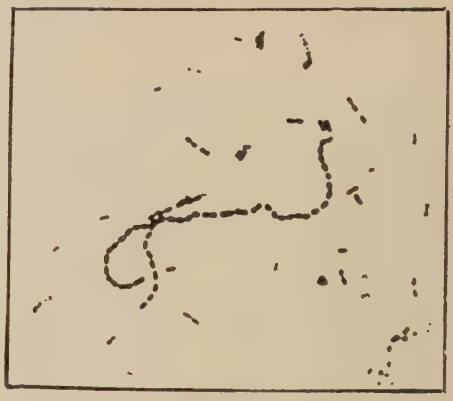
The universal appeal of Ice-Cream depends more than anything on the flavor and aroma of sweet, fresh milk and cream. Many influences may tend to impair or destroy that flavor, but by far the commonest is the degree of sourness, known as acidity.

A distinction must be drawn between the apparent acidity of freshly drawn milk and the true acidity of old milk. Initial or apparent acidity is present in all milk when drawn from the udder. As shown in the table on page 23, this averages 0.147 per cent. and ranges between 0.123 and 0.18 per cent., according to the breed of cows. It is due to certain acid phosphates, not to acid forming bacteria, and does not increase with age.

The troublesome acidity of milk products is lactic acid. In its pure state it is a colorless, sirupy fluid ($C_3H_6O_3$) with a very sour or bitter taste. It is a fermentation product of certain bacteria which convert the natural milk sugar (lactose) into acid. These bacteria are everywhere, particularly in milking machines, utensils, and containers used in handling, cooling, shipping, and processing the milk: this explains the need of cleaning and even sterilizing everything that comes in contact with the milk. They are on the hands of the milker and in the teats of the cow: and that is one reason the hands should be washed before milking and the first stripping of milk would best not go into the pail or milking machine.

The temperature at which lactic acid bacteria thrive best is between 60 and 100 degrees F., though they multiply in a much wider range of temperature. Since the milk is drawn at body temperature, it is important that it be cooled as quickly as possible after drawing it from the

udder, and kept cool until actually processed or used by the Ice-Cream Maker. At 50 degrees, their growth is slow: at 40, it is almost stopped.



STREPTOCOCCUS LACTIS X 1000
Lactic acid bacteria

As the acid forming bacteria increase, their fermentation of the natural milk sugar becomes more and more apparent. When the total acidity (including the initial acid phosphates) reaches about 0.22 per cent., it becomes noticeable to the taste; and at about 0.25 the acidity is sufficient to detract materially from the quality of the milk or cream. Unless such milk or cream is diluted with sufficient fresh product of very low acidity, the Ice-Cream made with it will be correspondingly lowered in quality.

The fermentation continues, increasing the acidity until the casein of the milk curdles (precipitates). The time required for this transformation varies with the temperature, as shown in the following table which assumes an average fresh milk.

Approximate Time Required to Reach Curdling Point at Different Temperatures

Milk kept at (degrees F.)	Curdles in (hours)
40	80
45	76
50	68
55	51
60	42
65	37
70	33
75	30
80	28
85	27
90	26

And yet it is not an uncommon thing for milk and cream to have a temperature of 60 to 70 degrees F. on arrival at the city plant. This could be prevented by never exposing the cans to sun or heat without covering them with a wet blanket over which a dry canvas is thrown.

Individual jackets are now offered to serve this purpose. The improved condition of the milk is worth the added cost of equipment and handling. In fact, it has been demonstrated as profitable to pay dairymen a substantial bonus for milk received at 55 degrees F. and a further substantial increase at 45. It would require about 3 tons of ice per cow, including shrinkage, to cool milk quickly to a temperature of 50 degrees F. or lower, the year round. The necessary ice house would cost perhaps $150.00. The use of ice or of cooling pipes on the farm may not be profitable without an added incentive. The Ice-Cream maker who, by properly cooled milk and cream, saves the cost of neutralizing acidity and who thereby insures a finer and more uniform quality of Ice-Cream, will not hesitate to pay a higher price for such milk and cream. The highest quality of Ice-Cream demands a mix that tests under 0.2 per cent. acidity. The manufacturer in the immediate vicinity of a dairy district should come well below that, as he is justified in expecting milk and cream of not more than 0.15 per cent. acidity.

The Ice-Cream plant may itself contribute largely to the high acidity of supplies by not promptly putting them in a cooler or by returning the cans unclean or sour. The cans should be used as receptacles for sweet milk and cream only, promptly cleaned when empty and, if possible, aired or exposed to the sun, with lid off, until time for returning them. Our Tru-White Washing Powder makes the cleaning easier and more effective. It cuts fat and dirt and leaves cans, tanks, vats, coolers, and other equipment sweet and pure. It contains nothing to injure the hands or attack metal.

It is a mistake to assume that the holding down of acidity is not important where neutralizing is part of the routine. A large proportion of the natural milk sugar (lactose) has been decomposed to create the acidity. While that acidity may be neutralized, the flavor of the lost lactose is gone, and with it the bloom and aroma of fresh milk or cream.

Approximate Pasteurizing Temperature to Reach Curdling Point at Different Acidities

Total acidity (per cent.)	Curdles at Temperature in pasteurizing (degrees F.)
0.25	180
0.27	175
0.29	170
0.30	165
0.32	160
0.34	155
0.35	150
0.36	145
0.38	140

Prevention is the best cure for acidity. Efficiency, economy and pride in a superior product—all demand that the clean, pure product of the dairy herd be properly handled and kept pure until dispensed, especially when in the form of Ice-Cream, the highest achievement of the caterer's art.

The degree of acidity limits the temperature at which milk or cream may be pasteurized without curdling. The foregoing table approximates it closely enough for practical use.

It will be seen from this that great care must be exercised not to pasteurize at a temperature higher than the acidity of the product will endure. The acidity test should be made before pasteurizing, and if a neutralizer is used, that too should be done before pasteurizing. The purpose of pasteurization is, primarily, to kill harmful (pathogenic) bacteria and, secondarily, to keep perfectly sweet milk and cream sweet longer by killing most of the bacteria. A mix running as high as 0.33 per cent. acidity is very apt to cook onto the pasteurizer coils and so effectively to insulate them as to interfere with normal heating. The use of milk concentrates makes it difficult to hold down acidity, and for that reason fresh milk and cream of low acidity should be given preference. If neutralization becomes necessary, proceed methodically, but hold down acidity to the utmost nevertheless. There is a limit to possible neutralizing without seriously affecting the flavor, as shown on page 240. It is a great mistake, therefore, deliberately to increase acidity for any reason whatever.

The use of protracted storage instead of either Meloine or Mello-Freeze as ripening aids, frequently causes high acidity. Perhaps the mix was already neutralized to get through the pasteurizer without curdling or to admit of homogenizing at high pressure. The flavor may therefore be already impaired, both on account of the decomposition of part of the milk sugar and on account of the addition of the alkali. It should not be forgotten that proper viscosity is not always developed by mere storage before the mix is distinctly sour. Under such conditions, the mix must be stored until the lactose which still remains is sufficiently decomposed or fermented, not only to overcome the possible alkalinity of the neutralizer, but also to **develop again the objectionable sourness which caused the neutralizer to be used in the first place.**

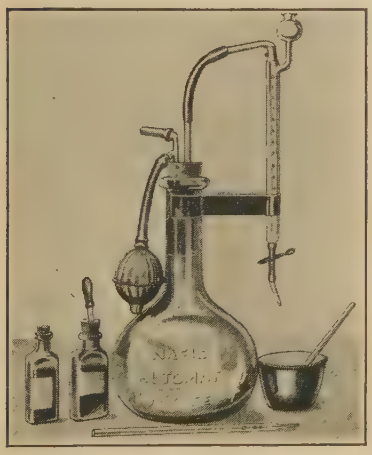
It is not necessary to **sacrifice the fresh, unimpaired flavor and quality** in order to obtain proper viscosity if either Meloine or Mello-Freeze is used, as they reduce the storage period of two or three days to one of a few hours.

It must not be overlooked that the bacterial growth (flora) of the ordinary Ice-Cream mix is composed of other types besides those which produce lactic acid. Frequently, in ripening by storage, some of these produce "off flavors", such as bitter, musty, and other undesirable changes which themselves **render the mix entirely unfit,** aside from any consideration of acidity. Meloine and Mello-Freeze constitute an in-

surance against these also by shortening the ripening period: in fact **they render Ice-Cream more wholesome.**

Determining the degree of acidity was formerly considered of value only in butter and cheese making. In other branches of the dairy industry the condition of milk and cream was determined by the slower method of counting the number of bacteria in a bacterial culture. But in recent years much attention has been given to the definite acid content, by direct test of the Ice-Cream mix or of the ingredients which enter into it. Milk and cream may be tested for acidity as a basis of payment, in conjunction with the butter-fat content, or the Ice-Cream mix may be tested to determine the exact quantity of neutralizer required to establish a definite or standard degree of acidity for uniform or correct processing, particularly in the homogenizer or viscolizer.

How to Determine Exact Acidity of Milk, Cream or Ice-Cream Mix.



Equipment for acidity test

Measure off carefully, with a 50 c.c. pipette, 50 c.c. of milk, cream, or Ice-Cream mix into a 150 c.c. beaker. Add to this 1 c.c. of phenolphthalein indicator solution (1% solution of phenolphthalein in pure neutral grain alcohol). Now fill a carefully cleaned and dried 50 c.c. burette with tenth-normal sodium hydroxide solution. Run the sodium hydroxide solution very slowly from the burette into the beaker containing the milk, cream, or mix, until sufficient has been added to develop a definite pink color which does not disappear within 30 seconds. The sample of milk, cream, or Ice-Cream mix must be stirred constantly and thoroughly during this operation.

To determine the per cent. of acid, multiply the number of c.c. of sodium hydroxide solution used by 0.018 for the reason that, when 50 c.c. of milk, cream or Ice-Cream mix are used, each c.c. of sodium hydroxide solution neutralizes 0.018 per cent. of acid.

Neutralizing Acidity

There are times and circumstances when the factors which influence acidity of the Ice-Cream mix are not under control. It becomes necessary to choose between a souring milk or cream and none at all. Successful pasteurizing, homogenizing at a desired pressure, or even the reclaiming of a sour mix may then make it necessary or expedient to reduce the acidity by adding a suitable alkali as neutralizer.

The practice of neutralizing does not interfere with decomposition, as the work of the bacteria goes right on; but the neutralization masks the evidence of the fermentation by temporarily changing the sourness until more lactose is decomposed to restore it.

The acidity of a high-acid mix may be reduced 0.15 per cent. (15/100 of one per cent.) without greatly impairing the flavor. A greater addition of neutralizer would impart an undesirable, abnormal flavor to the mix. The reduction must not be greater than enough to neutralize the actual lactic acid. Since the initial or apparent acidity may possibly approach 0.18, it is not always safe to reduce to a lower acid content than 0.18 or 0.2: to do so might create an excess of alkalinity or soapiness, which is even more objectionable than acidity. If the breed of cows is known, reference to the table on page 23 will show how far acidity may be reduced with probable safety; but, we repeat, the total reduction should not exceed 0.15 per cent. in any event. The increased serum solids of Ice-Cream which have a butter-fat content of less than 7 per cent. make it safer to limit the acid reduction for those low-fat Ice-Creams to not less than 0.2 per cent.

It should be the aim to reduce to a uniform acidity of perhaps 0.18 or 0.2 per cent. Accepting 0.15 per cent. as the limit of reduction, this enables the operation to save a mix which tests anywhere up to 0.33 or 0.35 per cent. acidity. It is not advisable to use a mix which tests higher than that.

Soapy or alkali flavor is due to an excess of alkali in haphazard neutralization. The bicarbonate of soda method, used according to our simple directions, is recommended if neutralization must be resorted to.

The Bicarbonate-of-Soda Method.

This method is to be preferred because it admits of reducing to a uniform degree of acidity; because bicarbonate of soda, commonly known as baking soda, is usually available; and because it presents fewer difficulties.

The first step is the acidity test. The acidity of successive lots varies more or less and, unless each batch is separately tested immediately before neutralizing, it is hardly possible to obtain uniformly satisfactory results. The total acidity is determined in the manner described on page 239, and the quantity of bicarbonate of soda required is determined from that.

From the total percentage of acidity found by the test, subtract the standard of acidity to which it is proposed to reduce, preferably 0.18 per cent. That leaves the percentage which must be neutralized. For example: the acid test shows 33/100 of one per cent. acidity; subtracting

18/100 of one per cent., leaves 15/100 of one per cent. to be neutralized which should be the limit.

0.33 per cent.
0.18
0.15 per cent.

Take that per cent. of the entire batch to determine the weight in pounds of lactic acid to be reduced. For example:

In the 100-pound mix.	In the 100-gallon mix.
100	100 gals. at 9 lbs.=900 lbs.
x.0015	900
	x.0015
0.15 lbs. lactic acid	1.35 lbs. lactic acid

To neutralize each pound of lactic acid, 15 ounces of bicarbonate of soda is needed. Multiply 15 ounces by the number of pounds lactic acid to be reduced in the batch. For example:

In the 100-pound mix.	In the 100-gallon mix.
15 ounces	15 ounces
x0.15 lb.	x1.35 lbs.
2.25 ounces.	20.25 ounces.
Ans. 2¼ ounces soda needed.	Ans.—1 lb. 4¼ oz. soda needed.

The combination of bicarbonate of soda with the acid mix forms sodium lactate and carbonic acid gas, which latter is driven off in pasteurizing. But no harm is done if the mix is not pasteurized and the tasteless gas left in. Some say it has a tendency to improve the product by accentuating fruit flavors.

It serves no good purpose to use the bicarbonate of soda in solution, as the added water would not only tend to make a coarser Ice-Cream, but it would further complicate matters by affecting the relative proportion of ingredients. Better use it dry, and well pulverized.

Neutralized mix requires "half again as much" Meloine as the quantities indicated in the table on page 70. If it is to be stored 24 hours or longer, that 150 per cent. is reduced one-half so that, in that case, the mix requires only three-fourths the quantity of Meloine indicated in that table. The quantities of sugar and water shown there would better remain unchanged, as they have been allowed for in the calculation of the formulas: to change them would affect the accuracy of the proportions in the formulas.

The following table shows, in convenient form, the quantity of bicarbonate of soda (commonly known as baking soda) required to reduce from various degrees of acidity to a uniform 0.18 per cent.

Quantity of Bicarbonate of Soda Needed to Reduce Acidity

To reduce lactic acid content of milk, cream, or Ice-Cream mix	Soda needed in the 100-pound mix (pounds)	Soda needed in the 5-gallon mix	Soda needed in the 100-gallon mix
From 0.33 per cent. to 0.18 per cent.	0.1406	1 ounce	1 lb. 4¼ oz.
From 0.32 per cent. to 0.18 per cent.	0.13125	1 ounce	1 lb. 3 oz.
From 0.31 per cent. to 0.18 per cent.	0.1269	¾ ounce	1 lb. 1½ oz.
From 0.30 per cent. to 0.18 per cent.	0.1125	¾ ounce	1 lb. ¼ oz.
From 0.29 per cent. to 0.18 per cent.	0.1031	¾ ounce	14¾ oz.
From 0.28 per cent. to 0.18 per cent.	0.09375	2½ tablesp.	13½ oz.
From 0.27 per cent. to 0.18 per cent.	0.0844	½ ounce	12¼ oz.
From 0.26 per cent. to 0.18 per cent.	0.075	½ ounce	10¾ oz.
From 0.25 per cent. to 0.18 per cent.	0.0656	½ ounce	9½ oz.
From 0.24 per cent. to 0.18 per cent.	0.05625	3 teasp.	8 oz.
From 0.23 per cent. to 0.18 per cent.	0.0469	2½ teasp.	6¾ oz.
From 0.22 per cent. to 0.18 per cent.	0.0375	2 teasp.	5½ oz.
From 0.21 per cent. to 0.18 per cent.	0.0281	1½ teasp.	4 oz.
From 0.20 per cent. to 0.18 per cent.	0.01875	1 teasp.	2¾ oz.
From 0.19 per cent. to 0.18 per cent.	0.0094	½ teasp.	1¼ oz.

The pressure of the homogenizer and viscolizer varies according to the acidity, as explained on page 208.

BACTERIA IN ICE-CREAM

The rapid development of the Ice-Cream industry has introduced many problems, some of which are bacteriological in nature. The demand for sweet cream during the warm season has developed suitable methods for the holding of cream during times of surplus. Competition, with the desire to make a better product more efficiently, has involved the science of bacteriology.

The number of bacteria in Ice-Cream as reported in the literature varies over wide limits. Counts of a few thousand per gram are few and uncommon while those running into the hundred thousands or millions are common. A bacterial count of 8,000,000,000 per c.c. was obtained in one of our large middle western cities. The average commercial Ice-Creams usually contain from 500,000 to 3,000,000 bacteria per cubic centimeter. Scoring contests in California have shown that it is possible, under commercial conditions, to produce Ice-Cream with counts lower than 78,000.

The bacterial content of an Ice-Cream is an accurate index of its freshness and of the care exercised in the production of the raw materials that are used. It also tells the care and cleanliness with which the product has been handled in the process of manufacture. Definite bacterial standards have not been set for Ice-Cream, as in the case of milk, but they no doubt will follow. Many Boards of Health at the present time, are looking with disfavor at Ice-Cream containing more than 1,000,000 bacteria per gram.

Sources of Bacteria.—Bacteria found in Ice-Cream come from either the materials that are used or from outside contamination. Eilenberger, in Memoir 18, Cornell Univ., gives the following counts to indicate the ingredients which contribute most bacteria in the making of Ice-Cream.

Bacteria in Ingredients (per gram)

	Minimum	Maximum
Standardized cream	1,150	37,600,000
Condensed milk	31,500	59,800,000
Sugar	20	255
Gelatin	48	891
Flavoring	10	321

Added counts (attested)

Meloine, average	220
Mello-Freeze, average	170
"Snow", average	20

Raw Materials.—Only cream and milk which are sweet, clean, free of taints and odor and as fresh as it is possible to obtain them, ought to

be used in the manufacture of Ice-Cream. These two ingredients usually supply 99 per cent. of the bacteria to the raw mix. Whole milk that is received in Ice-Cream plants will vary in bacterial content from 50,000 to 5,200,000 per cubic centimeter, cream from 300,000 to 32,000,000 c.c. The bacterial content of milk or cream is an accurate index of quality inasmuch as milk or cream produced under clean conditions, cooled at 40 degrees F. and kept at this temperature till delivery, should not exceed 250,000 per c.c. What has been said of whole milk and cream is equally true of skimmed milk that is used in compounding the mix.

Bacteria and Milk and Cream Fermentations.—When the bacterial content reaches a certain number, the milk or cream undergoes a fermentation. The type of fermentation the milk undergoes will depend upon the dominating type of bacteria.

The lactic acid curdling is the normal souring of milk brought about by a group of bacteria which have the property of producing lactic acid from the milk sugar (lactose). These organisms enter milk from the utensils and are not found in the udder of the cow. Because of their rapidity of growth souring of milk is the most common of milk fermentations. The causes of sour milk are, milk held at too high a temperature and contamination from improperly cleansed utensils.

Sweet Curdling.—Sometimes milk will coagulate or curdle with a sweet curd resembling the curd that is produced by the action of rennet. This fermentation is caused by a group of bacteria that are found on hay, straw, dust, manure, flies and cow hairs. This condition of sweet curdling is usually noticeable during a hot dry spell and frequently is terminated by a heavy rain. The bacteria that produce this condition of sweet curdling have the property of producing an enzyme similar to rennet that acts directly upon the albumen and casein of the milk. Unfortunately these same bacteria produce another ferment which induces putrefaction of the milk, consequently this type of fermentation is very undesirable.

Slimy or Ropy Milk.—The condition of slimy or ropy milk is due to the development in milk of certain species of bacteria that produce gelatinous capsules. The bacteria that cause this fermentation are quite common in water, wells, cisterns and cooking tanks, especially in the summer. Anything upon which the water is splashed or which comes in contact with the water will be contaminated with the ropy milk bacterium. This bacterium will grow readily in milk at low temperatures so that milk that is contaminated with it, even though kept cold, is liable to develop sliminess or ropiness. Consequently, care should be taken to prevent contamination of the milk. Cream may become similarly contaminated and will then develop a slight bitterness which is undesirable.

Alcoholic fermentations of milk and cream are usually caused by certain varieties of yeast which have the power to ferment the sugar in milk (lactose) and from it produce alcohol and carbon dioxide. It

is the production of carbon dioxide that causes yeasty cream to foam. The common varieties of yeast used in breadmaking cannot ferment lactose: they are inactive in milk.

Butter.—The finest Ice-Cream is always made with the use of fresh, sweet cream; but there are times when it is not obtainable and if no frozen cream has been stored, it may be necessary to use unsalted butter. Unsalted butter, like milk and cream, may carry innumerable microorganisms, and it is important to secure unsalted butter that is free of taints and especially free of yeasts and molds. If possible, it should be insisted that the butter be made under the strictest of clean conditions and obtained from a good grade of cream that has been properly pasteurized. Butter may carry from as low as 10,000 bacteria per gram to as high as several millions, under general average conditions.

Powdered milks (skimmed or whole milk) vary greatly in their bacterial content. Bacterial counts as low as 200 and as high as 500,000 have been reported. Because of the low moisture content of powdered milk, the bacteria that it contains are in a dormant state, the majority in the form of spores. The particular type of organisms which are spore formers are extremely objectionable as they produce proteolytic ferments which produce bitterness. They are also objectionable because, in their spore form, the bacteria are not as readily killed by pasteurization but are able to withstand the common pasteurizing temperatures. It is therefore important in the use of milk powder, once it has been added to the mix, not to allow any incubation of the organisms by the use of temperatures suitable for their reproduction (55-115 degrees F.).

Powdered milk must be kept in a cool, dry place and covered to prevent dust and sunlight from coming in contact with it. The keeping quality of skim milk powders is considerably greater than those powders which contain butter fat. The powder should be kept covered (better if sealed) to prevent its taking on moisture from the atmosphere. The absorption of moisture from the atmosphere will impair its ability to go into solution when being made up in the mix.

Condensed Milk should be looked upon as being subject to contamination to the same extent as milk. It may contain from a few thousand to several millions: bacterial counts as high as 59,800,000 per cubic centimeter have been reported. The ability of condensed milk to deteriorate is about the same as milk, except in the nature of the fermentation. The heating period in condensing has destroyed the common souring group of organisms, leaving those which have the property of decomposing (rotting) the protein and so producing bitterness.

Condensed milk should be kept cold and in such utensils that contamination from outside sources is reduced to a minimum.

Gelatin may and may not be an important source of bacteria in Ice-Cream. There have been reported counts of from 35 to 113,000,000 per gram. Gelatin of high bacterial content would be an important source of contamination, especially if the gelatin were added after pasteuriza-

tion. The bacterial flora of gelatin is made up to a considerable extent of spore formers and the numbers of bacteria may give an index of its quality, especially as to the sanitary quality of the material of which the gelatin is made.

High grade gelatins are now upon the market and can be secured. Such a gelatin having a low bacterial count will add little or no contamination to the mix. Gelatin manufacturers have made great strides in lowering the bacterial content of their gelatins by care and selection of the raw materials and by filtration of air for the drying of the gelatin.

Sugar itself is nearly a sterile product and, when stored and handled under proper conditions, has been found to be of no consequence in the addition of bacteria to the mix. Care should be exercised to protect sugar from contaminating influences, such as dust, mice, etc.

Vanilla and other flavorings.—The bacterial content of vanilla flavor is low. This undoubtedly is due, in part at least, to the alcohol in which it is contained. Flavors have never been considered as a source of contamination.

Water, if added to a mix, should be taken from a supply that is known to be pure and not polluted in any way with sewage. If ever in doubt about the water supply, send samples to the State Board of Health for analysis. Boil the water while awaiting the report on the test. Water may be a carrier of disease and care should always be taken to obtain an unquestionable supply.

The bacterial count of the Ice-Cream mix is that of the combined ingredients plus such additions as may be due to air and contact contamination in the operation of mixing. The bacterial content, per gram of the ingredients of an average Ice-Cream mix would, if all the usual sources of fat, solids, and bulk could be combined in it, be approximately as follows:

Cream	4,115,091	Butter	169,590
Milk	9,982,300	Gelatin	9,200
Skim milk	1,982,225	Sugar	65
Condensed milk	1,509,045	Water	25
Milk powder	143,600		

Total count, per gram of above hypothetical mix.....1,990,127

Whether the milk products were previously pasteurized or not, it is evidently desirable to pasteurize the mix.

Washing and Sterilizing of Equipment.—Too much stress cannot be put upon the washing and sterilizing of equipment. If not effectively done, the equipment with which the Ice-Cream comes in contact will be a considerable source of contamination. This is true in the case of milk, and the same results could be expected with Ice-Cream. The utensils with which milk comes in contact are the source of over 90 per cent. of the contaminating bacteria. Thoroughly cleaned and sterilized utensils are paramount in the production of a quality product.

Vats.—All vats used in compounding or aging the mix should be rinsed with lukewarm water followed with hot water containing a washing powder[1] and should be scrubbed to remove all traces of milk products. The reason for first washing the vat with lukewarm water is to remove and dilute the albumin, one of the milk proteins. Albumin coagulates at temperatures obtained in ordinary hot water. The albumin coagulation, in a thin film over the surface of the utensil, is difficult to remove and, if left, is a splendid feeding ground for bacteria. The method of first rinsing all dairy utensils with cold or lukewarm water is important.

The washing powder should then be rinsed out of the vat with hot water, followed by live steam. For efficient destruction of bacteria, the steam hose should be left in the closed vat until the walls of the vat reach 200 degrees F. and held at this temperature for at least 10 minutes. At the expiration of this time, the lids should be opened to insure rapid drying of the vat. If the vat has not tight covers, steam cannot be used. In that case it may be filled with water and the water brought to 190-200 degrees F. and held at this temperature for 10 minutes. The water treatment is a little more effective in the destruction of bacteria than steam, but it has some objections. The vat will not dry out to the same degree of dryness as with the steam treatment, and more steam will be required to heat the volume of water involved.

Chemical sterilization may be used. Though efficient, it is not to be recommended over steam or hot water because, unless the Ice-Cream manufacturer has considerable chemical knowledge, it is impossible for him to tell if the solution is at proper strength. However, if a new solution is made daily and the products obtained from reputable dealers, such condition as loss of strength will be materially lessened. Commercial preparations for the purpose are upon the market, the liquid form being solutions of sodium or calcium hypochlorite while the powders are chloramine T. A satisfactory homemade solution can be made up of bleaching powder, chlorinated lime. Care must be taken to secure fresh chlorinated lime containing at least 30 per cent. available chlorine. The method for preparing the disinfecting solution with chlorinated lime is as follows:

A 12-ounce can of chlorinated lime is mixed with a little cold water in a two-gallon crock, glass or earthenware, until a paste is formed with no lumps. Add sufficient water to fill crock, making a total of 2 gallons. Stir with a stick for 5 minutes, cover the crock and let settle over night. In the morning, syphon off by means of a rubber tube the clear liquid on top, care being taken not to suck over any of the white sediment. Syphon into glass jar or bottles, and use this stock solution at the rate of 1 pint to 6 gallons of water as a rinse for all utensils after they have been washed with washing powder.[1] For tanks and surface cooler the diluted solution may be sprayed with a spray gun, care being taken that the entire surface is covered with the disinfecting solution. Before using equipment which has been treated, it is best to rinse off

[1]We recommend the use of our Tru-White Washing Powder for this purpose.

with water; but if a period of several hours has elapsed, it is not necessary as the solution will have evaporated.

Ice-Cream Cans, Pails, Etc.—Metal utensils should be rinsed in warm water, washed in hot water and washing powder[1] and then steamed until they become hot enough to dry by their own heat. The scalding water treatment or the chemical sterilization described in the preceding paragraph can be used. It is important that pails, cans, etc., be dry, for if moisture is left in the utensil on cooling, the bacteria that have survived will begin to grow. It is possible for a can, after washing and steaming, to contain but 500 organisms; but if moisture is left in the can, the bacterial content will in 24 hours, be many millions. If the can is dry, growth will not take place. A simple way of determining if the cans are clean and dry is to take several cans, put covers on them, place them in a warm place (about 80 degrees F.), leave them there for 24 hours, and then examine: if the can has the clean, pleasant odor of a freshly cleansed can, the washing and drying process has been satisfactory; but if the can has undesirable, foul odor, it means that it received an unsatisfactory treatment.

Sanitary pipes and fittings can be effectively cleaned by rinsing with cold or lukewarm water, followed by brushing with hot water and washing powder,[1] and then steaming. Hot water treatment and chemical sterilization could also be employed. Take care to see that all moisture drains from the pipes. It is good practice to take down all pipe lines daily, though in some cases a longer time can elapse, never longer than one week.

Homogenizers, viscolizers and emulsifiers are complicated machines and likely to be important sources of bacteria, unless special care is taken in cleaning and sterilizing them. The detachable parts that come in contact with the mix should be taken apart, thoroughly washed in the manner of other containers and then steamed or boiled. The fixed or stationary parts too should be washed and steamed. The emulsifier and homogenizer are difficult to steam, but can be easily sterilized with chemical solutions or by passing through a large quantity of water at 190 degrees F. In the case of chemical sterilization, it would not be advisable to leave the solution in the machine for any great length of time, on account of the corrosive action of the chemicals. Therefore, when using hypo-chlorites, flush out the machine with water to remove the chemical disinfectants.

Freezers.—In washing freezers immediately after use, it is advisable to warm the drum with a gradual increase in temperature of the several successive rinsings, in order that the rate of expansion of the metals may be gradual. Wash for 5 minutes with hot water and washing powder[1] and rinse with hot water. The steam hose can then be introduced in the outlet gate and the freezer drum steamed for 3 minutes. Care must be taken to protect the brine thermometer: if it is not calibrated to register as high as 212 degrees F., then remove it first. By such wash-

[1]We recommend the use of Tru-White Washing Powder for this purpose.

ing, the bacterial content of a freezer may be reduced to 2 or 3 thousand, while freezers not properly washed may show bacterial contents of many millions.

Washing and sterilizing of equipment is important in producing Ice-Cream with a low bacterial content.

INFLUENCE OF COOLING ON THE BACTERIAL CONTENT OF ICE-CREAM

"Fabian and Cromley"[1] report that there was found no reduction during the cooling process of the Ice-Cream mix. In 52.17 per cent. of the samples there was an increase, the increase varying from 3.17 per cent. to 400.00 per cent., in 26.08 per cent. of the samples there was a decrease; and in 21.75 per cent., no change. This work demonstrates the fact that in the cooling process, there is a tendency of the bacterial count to increase rather than decrease as it has been frequently thought.

INFLUENCE OF MANUFACTURING OPERATIONS ON THE BACTERIAL CONTENT OF ICE-CREAM

Pasteurization and Bacteria.—Under ordinary conditions, there is no one factor that is so important in the manufacturing process as pasteurization, in controlling the bacterial count of the finished product. Experimental evidence shows that the process of pasteurization when properly done increases the wholesomeness of the Ice-Cream in that it removes, by destroying them, any disease bacteria that may have been introduced from the materials used in the preparation of the mix. For this reason alone every manufacturer should carefully pasteurize and not attempt to save a few minutes of time or a few degrees of temperature. False economy here may result in the survival of many thousands of bacteria.

Pasteurization is usually defined as the heating of milk or Ice-Cream mix to a temperature of 145 degrees F., holding at this temperature for a period of 30 minutes, and then cooling to 50 degrees F. or lower. In the case of Ice-Cream mix, in order to insure greater safety, it is best to heat to 150 degrees F., hold for 30 minutes at this temperature, and then cool to 50 degrees F. or lower. Such procedure usually causes a reduction of from 94 to 99 per cent. of all the bacteria present. That is, with the methods at present used for counting bacteria, the Ice-Cream mix may contain before pasteurization as many as 5,250,000 bacteria per cubic centimeter and after pasteurization but 22,000 or a reduction of 99.6 per cent. Fabian and Cromley report an average reduction of 98.27 per cent. when a temperature of 150 degrees F. for 30 minutes is used.

In an Ice-Cream mix there are many types of bacteria and the efficiency of pasteurization may depend to some extent upon the types of bacteria found. If the dominating type of organisms is susceptible to heat, then effectiveness is high. If the dominating types are those whose

[1]Mich. Agric. Coll.

thermal death points are higher than the pasteurizer temperature, then the effectiveness will be lowered. In any case, the effectiveness should not go lower than 94 per cent. Effectiveness of pasturization depends upon the number of bacteria in the mix before pasteurization: the greater the number, the greater the effectiveness.

Too much emphasis cannot be placed on the thoroughness of pasteurization as a means of lowering the number of bacteria in the finished product. The Ice-Cream maker, who is desirous of producing a wholesome product, as measured by bacteriological standards, can spend his time no more profitably than in paying strict attention to the process of pasteurization. If recording thermometers are used, they should be checked against a standard thermometer at frequent intervals to determine their accuracy.

The types of bacteria that survive pasteurization will depend upon the cleanliness and use of the pasteurizing equipment. When temperatures between 145-150 degrees F. together with proper methods, have been used, the type that survives in the greatest percentage is the lactic acid group or those organisms which cause souring. Next in importance of the surviving organisms is the proteolytic group or those organisms which attack the casein and albumin, digesting them, causing a bitter flavor. Both these groups can be kept in check by retarding their growth with cold.

Cultures of Ice-Cream bacteria in Petri dishes. In counting, each dot represents one bacterium or one cluster of bacteria.

There is a group of organisms, called "thermophyles", that may cause high bacterial counts in the Ice-Cream after pasteurization. The group has little or no action on Ice-Cream at the temperature under which it is ordinarily kept. It usually becomes noticeable in Ice-Cream that has been through pasteurizing equipment which has not been properly washed, or the cases where pasteurizing equipment is used for two or more successive mixes without washing. This group of micro-organisms grows at pasteurization temperatures and is very troublesome, especially when bacterially effective pasteurization is desired.

Homogenizing Viscolizing or Emulsifying and Bacteria.—Homogenization or emulsification of an Ice-Cream mix almost invariably causes an increase in the bacterial count. This may be due to contamination of the machine but more especially to the breaking up of the clusters of bacteria. A cluster of bacteria consisting of a dozen or more bacteria, so long as they remain clustered, will produce but one colony which is counted as one, but if this cluster is broken up and each individual cell liberated by the mechanical force of the homogenizer or emulsifier, each cell will then produce a colony and thereby increase the bacterial count as measured by the plate or Petri dish method. The extent of increase will depend upon the number of bacteria in the mix that exists in clumps. An average increase of 25 per cent. is normal, while maximum increases of 1,400 per cent. and minimum increases of 5.9 per cent. have been reported.[1]

INFLUENCE OF AGING ON THE BACTERIAL CONTENT OF ICE-CREAM MIX

The aging process is carried on at low temperatures in order to try to keep bacterial multiplication at a minimum. The temperatures used vary from 33 to 45 or 50 degrees F. Fabian and Cromley[2], when using a temperature of 35.6 degree F. found in 24 hours that the majority of the samples held their own or increased in bacterial content; that the increase varied from 4.35 per cent. to 409.9 per cent., with an average increase of 103. per cent. They do not report the bacterial growth for longer periods than 24 hours: for the mixes in which increases were noted showed that, even at as low a temperature as 35.6, there were present types of bacteria that were capable of reproduction, and that, under commercial conditions, it is not infrequent to store mix 4 to 10

[1]Olson and Fay, Kans. Agr. Sta., Journ. of Dairy Sci., Sept., 1925, report an average of 93.9 per cent. increase, ranging between extremes of 290.5 per cent. increase and 62.5 per cent. decrease.

[2]Mich. Agric. Coll.

days. Under such conditions, if there were present bacteria capable of growing at low temperatures, the number would grow exceedingly large. The previous care in the selection of raw materials, the cleaning and sterilizing of utensils, the proper pasteurization—all would have been of little value if the work there done to reduce bacteria were offset by an aging process which allowed the multiplication of bacteria.

Olson and Fay found that aging the Ice-Cream mix that had been cooled to 65 degrees F., placed in cans and these, without agitation, placed in a cold room of 38 degrees F., caused a very material increase in the bacteria content.

Commercial conditions under which the Ice-Cream is aged will vary in temperature between 38 and 50 degrees F. In the foregoing it was demonstrated that, at these temperatures, there is an increase in the bacterial content of the mix in a 24 hour period unless the mix is held at temperature below freezing, 32 degrees F. Meloine or Mello-Freeze can be used to shorten the aging period, which, in turn, will reduce the incubation period and **turn out a more wholesome product because of its low bacterial content.** Marshal[1] has found certain groups of bacteria that grow at low temperatures, such as the Ice-Cream mix is stored at, which develop better at such temperatures, cause astringent flavors, and produce poisonous split protein by-products.

Freezing.—The increase in bacterial count in the freezing process is usually not very marked, particularly if the Ice-Cream has been homogenized or emulsified. The whipping action of the dasher in the mix will break up clumps of bacterial cells, and in that manner cause an increase as measured by the plate count. The drop in temperature due to the freezing process has little or no effect upon the bacterial count.

Hardening and Storage.—When Ice-Cream mix is placed in the hardening room or packed in ice and brine, there is usually a marked decrease in the number of bacteria during the first few days. The decrease is probably due to the destruction, by the low temperature, of the less resistant bacteria. After the first few days, the rate of destruction becomes less, then there is an increase until about the 14th day. From the 14th day to the 90th day, the decrease is nearly regular. Extensive work done by Ellenberger[2] brings out these facts.

After Leaving Hardening Room.—The care of the product after leaving the hardening room is important, to keep the Ice-Cream from softening. Soft Ice-Cream is not as palatable as firm Ice-Cream. Because of the warmer temperature, soft Ice-Cream will cause the dormant bacteria to revive and start growing. The type of bacteria that do so are very undesirable. Ice-Cream should never be allowed to soften and then re-harden, but should be kept firm up to the time of using.

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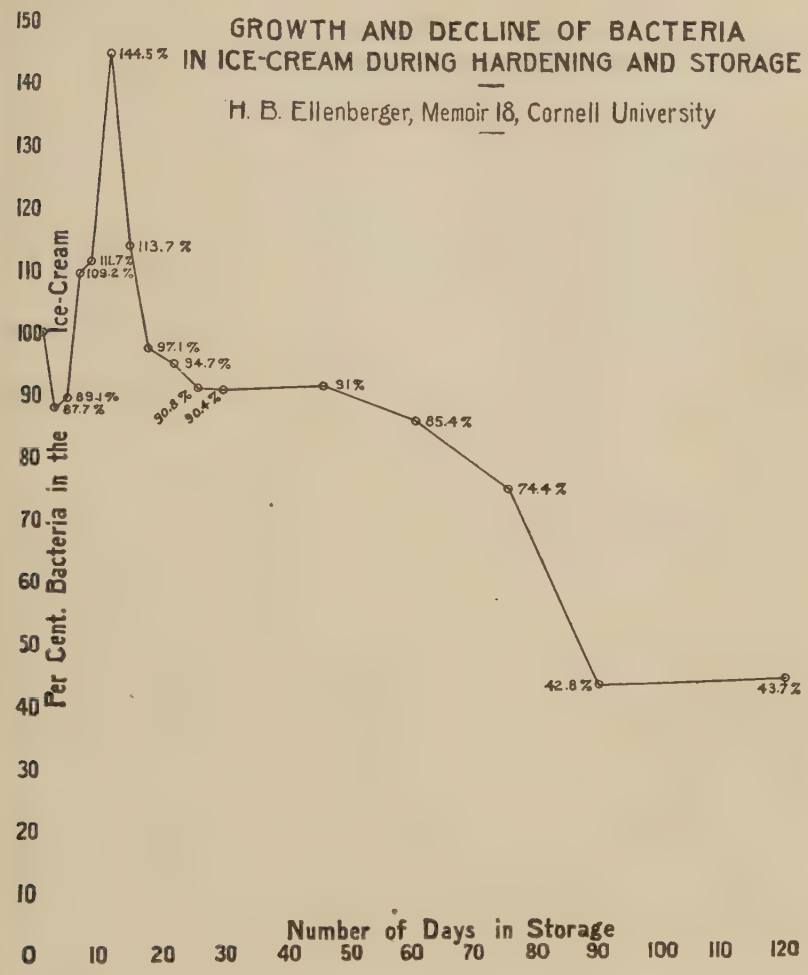
[1]C. E. Marshall, Head Dept. of Microbiol. Mass. Agric. Coll.
[2]H. B. Ellenberger, Memoir 18, Cornell University.


GROWTH AND DECLINE OF BACTERIA
IN ICE-CREAM DURING HARDENING AND STORAGE
H. B. Ellenberger, Memoir 18, Cornell University
Per Cent. Bacteria in the Ice-Cream
Number of Days in Storage
144.5 %
111.7 %
109.2 %
113.7 %
97.1 %
94.7 %
89.1 %
87.7 %
90.8 %
90.4 %
91 %
85.4 %
74.4 %
42.8 %
43.7 %
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
110
120

DEFECTS IN ICE-CREAM

Good Ice-Cream has the rich bloom of fresh milk products so blended with the added flavor as to make a delicious confection and wholesome food. The texture of good Ice-Cream is smooth and velvety, firm and yet readily melting. In appearance, it must be clean and uniform, pleasingly colored to harmonize with the flavor, and put up in a neat manner in smooth, clean, rustless containers. It must comply, without waste of materials, with the laws and regulations which govern.

Ingredients vary and the processes are so many that false economy or carelessness anywhere between the mixing tank and the dispensing cabinet can cause the defect that would injure the sale of the product.

Defects in flavor may be due to:

1. Too much or not enough flavoring.
2. Too much or not enough sugar.
3. Inferior or unsuited flavoring.
4. Use of inferior sugars and sirups.
5. Not enough milk fat or butter fat: may be due to sub-standard milk products or incorrect standardization of mix.
6. Old or off-flavor milk products: may be due to storage ripening; to weeds, turnips and the nature of the cattle feed; to exposure or contamination in unclean stables and store rooms; to rancid butter, oily cream, and old or bitter milk concentrates.
7. Cooked flavor: may be due to too much condensed or powdered milk or to pasteurizing at too high a temperature.
8. Sourness: due to keeping milk or cream at too high a temperature on the farm, in shipment, or at the Ice-Cream plant; or to storage ripening, to sour washcloths and faulty cleaning methods.
9. Soapy flavors: due to too much neutralizer for acidity.
10. Old or off-flavor eggs or dried egg yolk.
11. Stale fruits and rancid or moldy nuts.
12. Gelatin flavor: due to too much gelatin or to inferior quality.
13. Salty flavor: due to use of salt or salted butter in Ice-Cream formula, or to accidental entry of packing salt or brine into the cans.
14. Metallic flavor: due to action of high-acid mix on the metals it comes in contact with, or to the lack of liners for fruit or chocolate Ice-Cream.

Defects in body and texture may be:

1. Fluffy, snowy body and texture is the result of incorporating too much air for the proportion of solids in the mix.
2. Soggy, hard, unmelting body and texture: the result of not incorporating enough air for the proportion of solids in the mix.

3. Rubbery or livery: due to excessive proportion of gelatin or gum.

4. Sticky: due to an excess of gelatin, gum, sweetened condensed milk, corn sirup or glucose, and other fillers.

5. Weak or collapsing body: due to not enough solids for the swell or over-run obtained; too much sugar for the temperature maintained; to weak or inferior gelatin or not enough gelatin and Meloine or "Snow"; to excessive overrun; drawing from a freezer before the latent heat is entirely out of the mix; slow or insufficient hardening; inadequate refrigeration in transit or in the service cabinet.

6. Containing granules of butter: may be due to too high a temperature on entering the freezer; to freezing at too high a temperature or too slowly; to running the dasher too fast; to change of dairy stock to spring pasture; to lack of proper emulsifying of mix when butter is used; to churning before freezing; or to pasteurizing a mix that is too high in acidity.

7. Coarse texture: due to lack or incorrect proportion of Meloine or Mello-Freeze; to improper ripening; to lack of relative proportion of butter fat to other ingredients; to lack of correct proportion of serum solids and other solids not fat; to drawing the product from the freezer too soft; or to too slow hardening.

8. Icy or grainy texture: due to drawing the product from the freezer too soft; to the use of packing cans and containers that have not been sufficiently pre-cooled; to delay before hardening the drawn product; to hardening at too high a temperature; to packing while soft; to melting and refreezing in storage, in transit, or in the service cabinet; or to weak or inferior gelatin or not enough gelatin and Meloine or "Snow."

9. Sandy or gritty Ice-Cream: due to an excessive proportion of natural milk sugar (lactose) to the moisture content of the mix and for the temperature at which it is held at any stage between the hardening room and service cabinet; or to lactose crystals in milk concentrates.

10. Softening: due to keeping Ice-Cream at too high a temperature for the proportion of sugar in it; or to liquefactive organisms, chiefly in inferior gelatin.

Defects which may be due to bacterial content are:

1. Sourness: due to age of milk products and temperature at which they are held or to storage ripening.

2. Bitterness, putrefaction and other off flavors: due to milk or milk products or developed under storage ripening.

3. Unclean taste, odor or appearance, from any source whatever.

4. Coarseness when due to unsatisfactory ripening in the absence of Meloine or Mello-Freeze.

5. Softening when it is due to liquefactive bacteria.

Defects in color may be due to:

1. Too much or not enough color.
2. Incorrect selection of color to produce the desired shade.
3. Not in harmony with the flavor used.
4. Streaky, specked or uneven color; due to the use of colors not specially adapted for use in Ice-Cream and kindred products; to incomplete solution of dry colors; or to imperfect mixing with the rest of the mix.

Defects of package are:

1. Dirty, rusty or damaged packing cans.
2. Dirty or damaged packing tubs or shipping jackets.
3. Improperly packed to maintain, until delivery, a temperature below the softening point corresponding to the sugar content.
4. Packing cans unlined for chocolate (cocoa) and fruit ice creams.
5. Brick or package Ice-Cream with layers not uniform; or not neatly folded in clean wrapper or package.

ICE-CREAM SCORE CARD

(For Use in Ice-Cream Prize Contests)

Approved by Several State Agricultural Colleges

Exhibitor.....

Address.....

Class..... Exhibit No.....

ITEM	Perfect score	Score allowed	REMARKS
Flavor	45		
Texture	25		
Bacteria	20		Bacteria per c.c.
Color	5		
Package	5		
Total	100		
			Per cent. fat
			Per cent. t.s.

Signed.....

.....

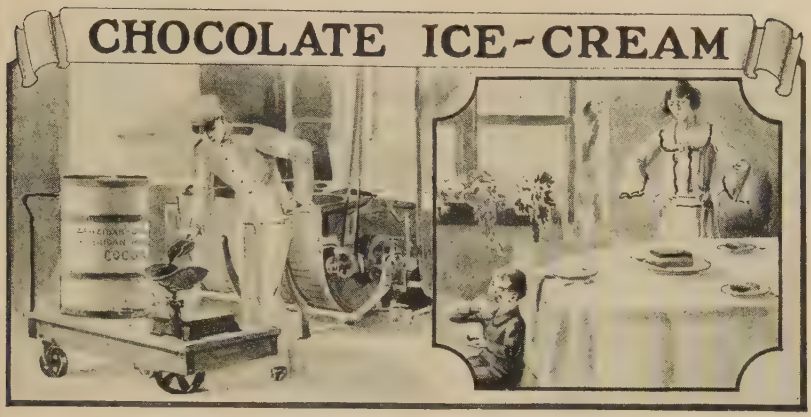
.....

Judges.

Date.....

NOTE—Entries which do not comply with local laws and regulations shall be disqualified and no score shall be reported.

BACTERIA—For entry with a count of 50,000 or less per cubic centimeter, judges shall allow 20 points. They shall deduct one point for each 25,000 additional bacteria per cubic centimeter.



CHOCOLATE (OR COCOA) ICE CREAM

Nothing better illustrates the difference of opinion of various Ice-Cream manufacturers than a review of trade practice, in different localities, as reported by a contemporary magazine.[1] Analyzing thirteen definite formulas submitted, we find cocoa variously used in the proportion of 1.02, 1.5, 1.62, 1.71, 2.5, 3, 3, 3.48, 4, 5, 5 and 12.01 pounds, in the hundred-pound mix. The first is scarcely enough for a good color, while the last is sufficient to destroy all semblance of Ice-Cream. With sugar and water, this latter actually uses 40 pounds added material in the hundred-pound mix. It would seem to be practically impossible to obtain proper swell or to hold it after obtaining it under such a handicap. At current prices of Chocolate (or Cocoa) Ice-Cream, a product so made would be sold at a loss and, normally, would not be relished.

Our wide experience with every conceivable condition of mix, equipment, climate, and community, enables us to prescribe a formula which may be depended on to give excellent results. The ordinary Chocolate (or Cocoa) Ice-Cream is usually coarse and unpalatable while that which is made in accordance with the following formula will prove smooth, agreeable, and refreshing. It is economical in that it obtains the best possible results out of available materials, insuring quality without waste. A cocoa sirup is made, which is added to the regular vanilla mix at the time of pasteurizing, and then homogenized, to make chocolate (or cocoa) Ice-Cream. This lowers the milk-fat content about two per cent., which may or may not be restored, and raises the sugar content nearly as much.

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[1] "Manufacturers Tell How to Make Chocolate Ice-Cream"; Ice-Cr. Trade Journ., June 1924.

Formula for Cocoa Sirup to Make Chocolate (or Cocoa) Ice-Cream.

	For the 100-Pound mix (pounds)	For the 5-gallon mix (approximate)[1]	For the 100-gallon mix (approximate)[2]
Zanzibar-Brand Cocoa	2.75	1 lb. 3 oz.	23¾ lbs.
Granulated sugar	2.25	1 lb.	20¼ lbs.
Regular vanilla Ice-Cream mix	6.25	2½ pts.	6¼ gals.
Total	11.25	4 pts.	9 gals., 6½ pts.

The quantity indicated is intended for the average taste, when Zanzibar Brand Cocoa is used, and does not apply to any other brand. Not only the strength must be considered: the delightful flavor of this brand is an important factor in business increase. A change in the grade of the Cocoa used would necessitate a change in the quantity both of the standard Ice-Cream mix and of the cocoa combined with it, and would produce a chocolate (or cocoa) mix having a fat and solids content differing from that given in the tables in which the above sirup is used.

Exact weights and measures are just as important here as in the main body of the mix, for the cocoa sirup constitutes 11¼ per cent. of Chocolate (or Cocoa) Ice-Cream, which is enough to destroy the proportions of the vanilla mix unless that cocoa sirup is itself proportioned with a definite end in view. Butter fat, serum solids, and total solids have all been carefully proportioned to meet any given standard without waste, and carelessness in making the sirup might throw the proportions out of balance as much as carelessness in making the regular mix.

First mix the cocoa and sugar; then slowly add enough of the cold regular vanilla mix (without Meloine or Mello-Freeze) to work them into a smooth paste, without lumps. Then add the remainder of the measured proportion of vanilla mix and continue to stir briskly until all is "dissolved" (in the common acceptance of the word).

Then heat the sirup, in a jacket kettle or in a double boiler, to 175 degrees F. and hold at that temperature for 20 minutes. Cool the sirup to about 40 degrees F. and keep it cold till used. Remember that the milk solids in the sirup are subject to decomposition under the action of lactic acid bacteria. Therefore, it may not be advisable to make a greater quantity of stock sirup than will be used within the limits of one or two working days.

If cocoa sirup must be made in a hurry, the necessary quantities of regular vanilla mix and cocoa may be heated to boiling point (212 degrees F.), the heat then shut off or the kettle removed from the fire,

[1]The total quantity of the sirup required for the 5-gallon mix is ½ gallon for all standards of Ice-Cream.

[2]The total quantity of the sirup required for the 100-gallon mix varies according to the milk-fat or butter-fat content of the mix, ranging between 9 gals. 6¼ pts. and 9 gals. 7½ pts., as shown in the tables on pages 262 and 263. The average is 9 gals. 6⅞ pts.

and the correct proportion of granulated sugar stirred into it till fully dissolved. It should then be cooled to 40 degrees for storing or to the temperature of the mix to which it is to be added.

In order to obtain the full strength of the cocoa, it is necessary to heat it. The sugar must be added to offset the natural bitterness of chocolate, and it also serves to facilitate the "solution" of the cocoa. However, the cocoa can be "dissolved" without it, if necessary.

If water instead of the regular vanilla mix were used to make cocoa sirup, it would not only lower the solids accordingly, but it would tend to make a coarser and less palatable product. Follow our formula and so produce economically a Chocolate (or Cocoa) Ice-Cream that is a better food and a superior confection.

The cocoa sirup may be added at any desired stage of operations between the mixing vat and the freezer, though it is added on the rise of temperature at pasteurization and then homogenized, in plants where precise methods prevail. This is more important in summer than at other seasons. If large enough quantities of it are made to warrant mixing it in separate batches, that would probably be the most efficient method. The pasteurizer and homogenizer do not injure it. It must not be overlooked, however, that the cocoa is even heavier than sugar, which makes it necessary to agitate the mix thoroughly when drawing from the ripening vat or when emptying the ripening cans. In plants equipped with ripening vats and power agitators, it may be an efficient method to add the cocoa sirup in the ripening vat: in small operations, it may be easier to add the measured proportion of cocoa sirup to each freezer load before actual freezing begins.

See that the cocoa sirup is of about the same temperature as the mix, when combining the two: if the hot sirup is poured into a cold mix, dark specks may result in the finished product.

Cocoa may be added to the mix in the dry state. Add cocoa on the rise of temperature, at pasteurization. At the completion of the pasteurizing process, homogenize it. The method cannot be used unless the mix is homogenized or viscolized: it will not work with the emulsor, as it will clog the plates. The disadvantage is that the entire mix is chocolate.

The storage cans for cocoa sirup and the packer cans for frozen Chocolate (or Cocoa) Ice-Cream should be well and completely tinned or they should have a liner inserted to prevent the greenish black discoloration caused by the action of tannates (in cocoa) on iron.[1] If the greenish black discoloration appears even where such precautions are used, then molds (micro-organisms) are the cause, the visible evidence of incorrect sanitation. The best remedy and preventive for that is a thorough use of our Tru-White Washing Powder in all vats, containers, sanitary pip-

[1]Prof. A. C. Dahlberg, dairy research, N. Y. State Agric. Exper. Sta.

ing, machinery, utensils, floors, and tables. Hands and clothing too must be kept clean.

The color of the Chocolate (or Cocoa) Ice-Cream after hardening will be two shades darker than it is when drawn from the freezer.

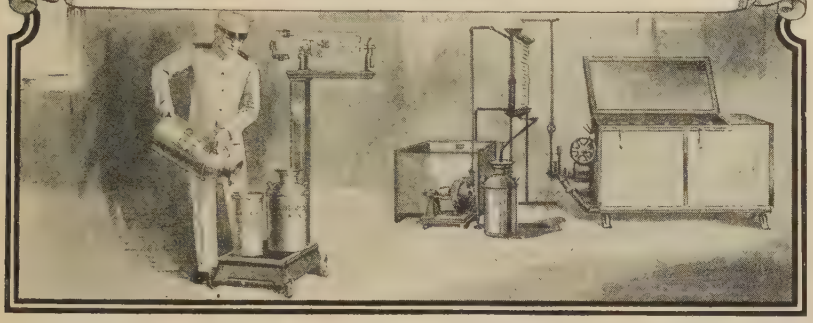
Chocolate Coated Ice-Cream Bars, sold under various registered trade names such as **Eskimo Pie, Polar Bar, Artic Bar,** and others, are usually made of Vanilla Ice-Cream covered with a coating of chocolate that is high in cocoa butter. The object of the high cocoa butter content of the chocolate is to harden the outer coating and keep it firm. The Ice-Cream can be frozen in standard 2-gallon brick forms, cut perhaps 80 to 96 bars to the gallon. These are dipped in milk chocolate at 90 degrees F. or in ordinary sweet chocolate at 100 to 108 degrees F. The Ice-Cream should be extra hard and should not, at any time, be allowed to go above 10 degrees F. The dipped bars are individually wrapped, usually in tin-foil, packed in cartons containing two or more dozen, and quickly returned to the hardening room.

Babe Ruth and Cannon Ball are registered trade names of products similar to the chocolate covered bars, except that they are in the form of a baseball or cannon ball and poured into molds instead of being cut out of bricks.

Cold Dog is the registered trade name of a product similar to the chocolate coated bars, except that it is in cone form.

Pickaninny Freeze is the registered trade name of a product which consists of Raspberry-Red colored Ice-Cream in the form of a slice of watermelon. Drops of milk chocolate, hardened to resemble ripe seeds, can be added through the fruit funnel and so frozen into the Ice-Cream. The "slices" are molded in forms.

STANDARDIZED CHOCOLATE (OR COCOA) ICE CREAM



How regular vanilla mix is altered by adding cocoa sirup.—If the formula for cocoa sirup on page 258 is examined it will be found that 2¾ per cent. of cocoa and 2¼ per cent. of granulated sugar replace an equal percentage of the vanilla mix to make 100 pounds of Chocolate (or Cocoa) Ice-Cream mix. The volume of the vanilla mix replaced has less solids and weighs less than the volume of sugar and cocoa which replaces it. For example, in the 10% mix, the volume of the 5 pounds cocoa and sugar is 0.3803 gallon. The volume of an equal weight of mix replaced is 0.5531 gallon and its solids weight only 1.708 pounds as compared with 4.88 pounds in the sugar and cocoa.

It is obvious, therefore, that the milk-fat or butter-fat and the milk solids not fat are decreased in using the regular vanilla mix to make Chocolate (or Cocoa) Ice-Cream and that the total solids are increased. While this provides body in the finished product, it lowers the swell to the extent of the displacement.

In common practice, nothing is added to compensate for the loss of butter-fat and other milk solids. In states where no allowance is made for Chocolate (or Cocoa) Ice-Cream, such a finished product falls below the legal standard: where a two-point reduction is allowed on account of added cocoa sirup, the butter fat content is wastefully high. Thus, in one case, it is bad practice to use the regular vanilla mix without adding cream or other concentrate to compensate for lowered milk solids: in the other, it is wasteful to use it without a volume provider, either milk or skim milk.

The accompanying tables cover the various methods of making the chocolate (or cocoa) mix. Each of them fully explains itself.

In freezing, hardening and storing Cocoa Ice-Cream, a lower temperature is necessary than for the standard vanilla mix. This is due to the greater proportion of sugar, although the average hardening room temperature is sufficiently low to handle it satisfactorily. It merely takes longer.

CHOCOLATE (OR COCOA) ICE-CREAM

Using the Regular Vanilla Mix Without Restoring Lowered Milk Solids[1]

The standard of the resulting Chocolate (or Cocoa) Ice-Cream mix must be kept in mind to avoid possible violation of law.

Standard vanilla Ice-Cream mix (per cent. milk-fat)	For 100-lbs. mix		For 5-gal. mix		For 100-gal. mix		Standard of resulting Chocolate (or cocoa) Ice-cream mix				Calculated weight per gallon of unfrozen mix at 68° F. (pounds)	Calculated weight per gallon of frozen chocolate Ice-Cream (pounds)
	Quantity regular vanilla Ice-Cream mix (pounds)	Quantity cocoa sirup (pounds)	Quantity regular vanilla Ice-Cream mix (gallons)	Quantity cocoa sirup (pints)	Quantity regular vanilla Ice-Cream mix	Quantity Cocoa sirup	Milk-fat (per cent.)	Milk solids not fat (per cent.)	Total solids (per cent.)	To be drawn when swell is at (per cent.)		
2.4	88.75	11.25	4½	4	90 gals. ¾ pt.	9 gals. 7¼ pts.	2.28	11.09	33.11	76.64	9.346	5.29
3.50	88.75	11.25	4½	4	90 gals. 1 pt.	9 gals. 7 pts.	3.33	10.87	33.63	78.37	9.318	5.22
4	88.75	11.25	4½	4	90 gals. 1 pt.	9 gals. 7 pts.	3.80	10.76	33.90	79.16	9.309	5.20
5	88.75	11.25	4½	4	90 gals. 1 pt.	9 gals. 7 pts.	4.75	10.56	34.46	80.75	9.284	5.14
6	88.75	11.25	4½	4	90 gals. 1 pt.	9 gals. 7 pts.	5.70	10.35	35.03	82.34	9.265	5.08
7	88.75	11.25	4½	4	90 gals. 1¼ pts.	9 gals. 6¾ pts.	6.65	10.16	35.60	83.91	9.243	5.03
8[1]	88.75	11.25	4½	4	90 gals. 1¼ pts.	9 gals. 6¾ pts.	7.60	9.96	36.15	85.50	9.224	4.97
9	88.75	11.25	4½	4	90 gals. 1¼ pts.	9 gals. 6¾ pts.	8.55	9.76	36.73	87.09	9.201	4.92
10	88.75	11.25	4½	4	90 gals. 1¼ pts.	9 gals. 6¾ pts.	9.50	9.56	37.31	88.66	9.18	4.87
11	88.75	11.25	4½	4	90 gals. 1¼ pts.	9 gals. 6¾ pts	10.45	9.35	37.88	90.25	9.16	4.82
12	88.75	11 25	4½	4	90 gals. 1½ pts.	9 gals. 6½ pts.	11.40	9.15	38.45	91.84	9.139	4.76
13	88.75	11.25	4½	4	90 gals. 1½ pts.	9 gals. 6½ pts.	12.35	8.95	39.03	93.41	9.119	4.72
14	88.75	11 25	4½	4	90 gals. 1½ pts.	9 gals. 6½ pts.	13.30	8.85	39.60	95.	9.098	4.67
15	88.75	11.25	4½	4	90 gals. 1½ pts.	9 gals. 6½ pts.	14.25	8.54	40.17	96.59	9.079	4.62
16	88.75	11.25	4½	4	90 gals. 1½ pts.	9 gals. 6½ pts.	15.20	8.34	40.75	98.16	9.058	4.57
17	88 75	11 25	4½	4	90 gals. 1¾ pts.	9 gals. 6¼ pts.	16.15	8.14	41.33	99.75	9.037	4.52
18	88 75	11.25	4½	4	90 gals. 1¾ pts.	9 gals. 6¼ pts.	17 10	7.94	41.91	101.34	9.016	4.48
19	88.75	11 25	4½	4	90 gals. 1¾ pts.	9 gals. 6¼ pts.	18.05	7.73	42.48	102.91	8.997	4.43
20	88 75	11 25	4½	4	90 gals. 1¾ pts.	9 gals. 6¼ pts.	19.	7 53	43.06	104 50	8.977	4.39

[1]In Ala., Tenn., and W. Va., this chocolate mix may be made to comply with statutory requirements by either one of the following additions (which supply the milk fat lost by the addition of the sugar and water in the cocoa sirup): Cream, 18 per cent., in the 100-lb. mix, 1.8 pounds; in the 5-gal. mix, 1 pt.; in the 100-gal. mix, 1 gal. 7¾ pts. Or unsalted butter, in the 100-lb. mix, 0.25 pounds; in the 5-gal. mix, 2 oz.; in the 100-gal. mix, 2 lbs. 5 oz.

CHOCOLATE (OR COCOA) ICE-CREAM

Using the Regular Vanilla Mix With Milk Solids Restored[1]

7% Milk Fat—Standard for Mass.
8% Milk Fat—Standard for Ark., Conn., Ga., Ill., Ind., Miss., Mo., N. J., N. Y., N. C., O., Pa., R. I., Va., Wash.
10% Milk Fat—Standard for Ariz., Cal., Colo., Kan., Ky., La., Md., Mont., Ore., Wyo.
12% Milk Fat—Standard for Iowa, Mich., Minn., N. Dak.
14% Milk Fat—Standard for Fla., Hawaii, Idaho, Me., Neb., Nev., N. H., Okla., Phil. Is., S. Dak., Tex., Utah, Vt., and under federal (U. S.) regulations.

Standard of Chocolate (or Cocoa) Ice-Cream (per cent. milk fat)	Ingredients	Quantity for 100-pound mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in chocolate (or cocoa) mix (per cent.)	Calculated weight per gallon of chocolate (or cocoa) mix at 68° F. (pounds)	Calculated weight per gallon of frozen chocolate (or cocoa) Ice-Cream (pounds)
7	Regular 7% vanilla mix	84.44	4 gals. 2¼ pts.	85 gals. 5¾ pts.	35.88	9.24	5.04
	Cocoa sirup	11.25	4 pts.	9 gals. 6¾ pts.			
	Cream, 18 per cent	3.57	1½ pts.	3 gals. 7¼ pts.			
	Powdered skim milk	0.74	5½ oz.	6 lbs. 14 oz.			
7	Regular 7% vanilla mix	87.54	4 gals. 3½ pts.	89 gals. ½ pt.	36.34	9.257	5.044
	Cocoa sirup	11.25	4 pts.	9 gals. 7 pts.			
	Unsalted butter	0.52	4 oz.	4 lbs. 14 oz.			
	Powdered skim milk	0.69	5¼ oz.	6 lbs. 6 oz.			
8	Regular 8% vanilla mix	83.50	4 gals. 1¾ pts.	84 gals. 5¾ pts.	36.35	9.213	4.847
	Cocoa sirup	11.25	4 pts.	9 gals. 7½ pts.			
	Cream, 18 per cent	4.50	2 pts.	4 gals. 7¼ pts.			
	Powdered skim milk	0.75	5 oz.	6 lbs. 5 oz.			
8	Regular 8% vanilla mix	87.47	4 gals. 3½ pts.	88 gals. 3¾ pts.	36.92	9.183	4.833
	Cocoa sirup	11.25	4 pts.	9 gals. 6½ pts.			
	Unsalted butter	0.60	4½ oz.	5½ lbs.			
	Powdered skim milk	0.68	5 oz.	6¼ lbs.			
10[2]	Regular 10% vanilla mix	85.27	4 gals. 2¾ pts.	86 gals. 5 pts.	37.85	9.179	4.748
	Cocoa sirup	11.25	4 pts.	9 gals. 6¾ pts.			
	Cream, 30 per cent	2.80	1¼ pts.	3 gals. ½ pt.			
	Powdered skim milk	0.68	5 oz.	6¼ lbs.			
10[2]	Regular 10% vanilla mix	87.31	4 gals. 3½ oz.	88 gals. 6¼ pts.	38.14	9.189	4.753
	Cocoa sirup	11.25	4 pts.	9 gals. 6¾ pts.			
	Unsalted butter	0.77	5¾ oz.	7 lbs. 2 oz.			
	Powdered skim milk	0.67	5 oz.	6 lbs. 3 oz.			
12	Regular 12% vanilla mix	84.36	4 gals. 2¼ pts.	85 gals. 5¼ pts.	39.02	9.132	4.644
	Cocoa sirup	11.25	4 pts.	9 gals. 6½ pts.			
	Cream, 30 per cent	3.73	1¾ pts.	4 gals. ½ pt.			
	Powdered skim milk	0.66	5 oz.	6 lbs. 1 oz.			
12	Regular 12% vanilla mix	87.15	4 gals. 3½ pts.	88 gals. 4¾ pts.	39.34	9.146	4.65
	Cocoa sirup	11.25	4 pts.	9 gals. 6¾ pts.			
	Unsalted butter	0.95	7 oz.	8 lbs. 13 oz.			
	Powdered skim milk	0.65	4¾ oz.	5 lbs. 15 oz.			
14	Regular 14% vanilla mix	83.22	4 gals. 1¾ pts.	84 gals. 3½ pts.	40.06	9.085	4.523
	Cocoa sirup	11.25	4 pts.	9 gals. 6½ pts.			
	Cream, 30 per cent	4.89	2¼ pts.	5 gals. 2½ pts.			
	Powdered skim milk	0.64	4¾ oz.	5 lbs. 13 oz.			
14	Regular 14% vanilla mix	86.97	4 gals. 3½ pts.	88 gals. 3½ pts.	40.57	9.103	4.052
	Cocoa sirup	11.25	4 pts.	9 gals. 6½ pts.			
	Unsalted butter	1.14	8½ oz.	10 lbs. 7 oz.			
	Powdered skim milk	0.64	4¾ oz.	5 lbs. 13 oz.			

[1]The milk solids being restored to the standards in the table on page 17, swell and yield per gallon remain unchanged.

[2]In Kansas, draw when swell is at 93.24 per cent.

CHOCOLATE (OR COCOA) ICE-CREAM

Using the Regular Vanilla Mix With Milk Solids Reduced[1]

10% Milk Fat, reduced from 12%—Standard for Wis.

Ingredients to be combined to make 10 per cent. Chocolate or Cocoa mix	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids (per cent.)	Calculated weight per gallon of chocolate (or cocoa) mix at 68 degrees F. (pounds)	Calculated weight per gallon of frozen Chocolate (or Cocoa) Ice-Cream (pounds)
Regular 12% vanilla mix.....	74.24	3¾ gals.	75 gals. 1½ pts.			
Cocoa sirup.....	11.25	4 pts.	9 gals. 6½ pts.			
Whole milk (3.69% milk fat)....	9.16	4 pts.	9¾ gals.	35.01	9.113	4.713
Cond. skim milk (3 to 1).....	5.35	2 pts.	5¼ gals.			

[1]The milk-solids-not-fat, swell and yield are those for the 10 per cent. mix shown in table on page 17.

OTHER STANDARD ICE-CREAMS

The standardized mix represented by the formulas on pages 124 to 192 may be made in other flavors besides vanilla. Seasonal demands may make maple or wintergreen flavor a welcome relief in spring, lemon or orange flavor in summer, and so on. Special functions may make coffee or other flavor desirable for the sake of variety.

Such flavors may require somewhat different treatment and are therefore grouped together here with appropriate instructions for each.

LEMON ICE-CREAM
(Without Fruit or Fruit Juice)

Make a regular mix of the desired standard, omitting vanilla flavoring.

Add sufficient True Royal Lemon Flavoring Extract or Lemon Emulsion to give desired flavor. Color to preferred shade with Lemon Shade Yellow liquid or dry color.

Freeze, harden and pack in usual way.

ORANGE ICE-CREAM
(Without Fruit or Fruit Juice)

Make a regular mix of the desired standard, omitting the vanilla flavoring.

Add sufficient True Orange flavoring extract or emulsion to give it the desired flavor. Color to desired shade with Naval Orange Shade Yellow liquid or dry color.

When cream is nearly frozen, while dasher is revolving, very slowly add citric acid solution, made according to formula on page 368, as follows:

To 100-pound mix	1.217 lbs.
To 5-gallon mix	7½ fl. oz.
To 100-gallon mix	9½ pints

Complete the freezing. Harden and pack in usual way.

NEW YORK STYLE ICE-CREAM
Without Eggs.

Make a regular vanilla mix of the desired standard and quantity.

Color the mix a rather deep cream or light yellow shade with Yolk-Em Egg Shade liquid or dry color.

Freeze, harden and pack in usual way.

This is a method of making New York Ice-Cream much in use in the larger cities. Ice-Cream so made lacks the characteristic egg flavor; but as the name is a mere convention, it would satisfy many.

CARAMEL ICE-CREAM

Make a regular vanilla mix of the desired standard. Add to it sufficient Carameline to give the desired flavor. It will then be of the proper shade of color for that degree of strength of flavor. Freeze, pack, etc., in the usual manner.

COFFEE ICE-CREAM

Make a regular vanilla mix of the desired standard Add sufficient True Coffee Flavoring Paste to give the desired flavor Freeze, pack, etc., in the usual way.

MAPLE ICE-CREAM

Make a vanilla mix of the standard desired. Add sufficient Imitation Maple Flavor or Emulsion to give desired flavor, and enough Maple Shade Brown dry color to make it of right shade.

Freeze, pack, etc., in usual manner.

COGNAC ICE-CREAM

Make a regular vanilla mix of the standard desired.
Add to it sufficient Imitation Brandy flavor to give the desired taste.
Freeze, pack, etc., in the usual way.

RUM ICE-CREAM

Make a vanilla mix of the standard desired. Add to it sufficient Imitation Rum flavor to give the desired taste.

Add sufficient Caramel-Shade Brown dry color to give desired depth of color.

Freeze, pack, etc., in the usual way.

PEPPERMINT ICE-CREAM

(Fine served with Chocolate (or Cocoa) Ice-Cream)

Make a regular vanilla mix of the standard desired.

Flavor with True Peppermint Flavoring extract or emulsion, to taste.

Color with Creme de Menthe Shade Green color.
Freeze, harden, pack, etc., in usual way.

SASSAFRAS ICE-CREAM

Make a regular mix of the desired quantity and standard, omitting the vanilla flavoring.

Flavor to taste with True Sassafras Flavoring extract or emulsion.

Color to proper shade with Caramel Shade Brown dry color.

Freeze, harden and pack in usual way.

WINTERGREEN ICE-CREAM

Make a regular mix of the desired quantity and standard, omitting the vanilla flavoring.

Flavor to taste with True Wintergreen flavoring extract or emulsion. Color with Liquid Color for Ice-Cream.

Freeze, harden and pack in usual way.

WILD CHERRY ICE-CREAM

Make a regular mix of the desired quantity and standard.

Flavor to taste with Imitation Wild Cherry flavoring. Add a little True Bitter Almond flavoring extract and a small quantity of True Lemon flavoring extract or emulsion. Color to shade preferred with Cherry Shade Red liquid or dry color.

Freeze, harden, pack, etc., in usual way.

MUSKMELON ICE-CREAM

Make a regular mix of the desired quantity and standard, omitting the vanilla flavoring.

Flavor to taste with Imitation Muskmelon flavoring.

Color with Liquid Color for Ice-Cream.

Freeze and harden in usual way. It is desirable, when convenient, to pack Muskmelon Ice-Cream in melon-shape bricks.

FRUIT AND NUT FLAVORED ICE-CREAM
(Without Fruit or Fruit Juices and Nuts)

Apple, almond, banana, blackberry, currant, grape, lime, maraschino, peach, pear, pineapple, pistachio, plum, raspberry, strawberry and walnut flavored Ice-Cream may be made without fruit or nuts, and, while not equal to that in which the fruits or nuts are used, it serves very satisfactorily when fruits and nuts are not available or too expensive.

Make a regular vanilla mix of the desired quantity and standard. Flavor it to taste, first with vanilla in the usual way, then with flavoring or emulsion of the flavor desired. Add a small quantity of True Lemon extract or emulsion. Color the proper shade in accordance with the table on pages 100 and 101. Freeze, harden and pack in the usual way.

FRUIT ICE-CREAM

(Standard or Regular Mix)

DIRECTIONS FOR MAKING

The fruit for which the fruit tables are calculated is cold-pack fruit, packed two parts of fruit, by weight, to one part of sugar.

If cold-pack fruit containing a smaller quantity of sugar, or fresh fruit or canned fruit is used, it should be standardized before adding it to the mix, in accordance with the table on page 280.

Cold pack or other preserved fruits containing more than one-third sugar by weight cannot be used with the regular vanilla mix, because the excess sugar would throw the mix out of balance. Special mixes for use with such fruit can readily be made by using the formulas for the regular mix, omitting sufficient sugar to bring the sugar content of the mix, with fruit added, down to standard and making such additions as may be necessary to keep the fat contents up to standard. The following tables may serve as guides in making such additions.

The low quantity of cherries used is due to the fact that they are used principally to please the eye, depending on the flavoring for the taste. If cherry were an item of strong competition, more might be used.

Strawberries are given at double the quantity of cherries. Formerly a much smaller proportion was used; but competition has forced a general increase. When a high-grade Strawberry Ice-Cream is desired, the fruit should be added after the cream is frozen, stirring it in with a clean paddle. The dasher in the freezer smashes berry fruit while the paddle permits keeping them whole, yielding a finished Ice-Cream of finer appearance.

The vanilla flavoring in the regular vanilla mix makes a very fine foundation for the fruit flavors and enriches them.

The mix should be flavored to about one-half desired strength with flavor or emulsion of the same name as the fruit, if one has been provided, and there should always be added a little True Lemon extract or emulsion to give zest to the flavor.

Zanzibar-Brand Flavoring Extracts and Flavors, Heller's flavoring Emulsions and Malaboza Pure Food Colors are specially prepared for this use. The formulas are calculated for their use. They are economical, effective, and pure.

Where Zanzibar-Brand Extracts and Flavors or Heller's Emulsions are not mentioned for any particular fruit, it may be assumed that its natural flavor does not need a supplement.

Prepare the fruit mix in porcelain lined containers, glass lined holding vats, graniteware, or glazed earthenware crocks, as there might otherwise be a metallic flavor caused by the action of fruit acid on metal.

For the same reason, insert a liner in all packer cans and brick form boxes before drawing the frozen Fruit Ice-Cream into them from the freezer. Such liner must, of course, be pre-cooled like the cans and boxes themselves.

The mix should, of course, be appropriately colored. A table showing the colors which should be used with various fruits, etc., will be found on pages 100 and 101.

Be careful to select from the following tables (pages 270 to 279) that method of compounding the mix that will produce an Ice-Cream up to the statutory standard (if any) in your state and up to federal requirements if the Ice-Cream is to be used in interstate commerce.

These tables provide the regular fruit mix—the basic Fruit Ice-Cream mix—to which any fruit may be added in the prescribed manner.

With Milk Fat Reduced

For example, assume that you are in a state which has adopted, as many have, the Federal standard. Complying with the law we will assume that you are making a 14 per cent. vanilla or plain Ice-Cream for general use. A law requiring a 14 per cent. standard usually permits you to reduce the milk fat content to 12 per cent. if fruit or nuts are added.

You, therefore, select as your guide the table on page 274, headed "12% milk fat reduced from 14%."

There you find 4 sets of formulas for as many classes of fruit. Take the one for the fruit you wish to use, say cherries. That is in the fourth class, and two formulas are provided. The first one is to be preferred if the ingredients there named—skim milk and powdered skim milk—are available.

For a 100-gallon mix, yielding about 175 gals. of finished Cherry Ice-Cream, take 86 gallons 7 pints of regular 14 per cent. vanilla mix, add to it 2 gallons 5½ pints of skim milk and 14 pounds 6 ounces of powdered skim milk. Flavor it with Imitation Cherry flavor or emulsion, to about one-half the desired strength, and add a little True Lemon extract or emulsion to give it a zest that greatly improves the Ice-Cream. Color the desired shade with Cherry Shade Red liquid or dry color.

When mix is nearly frozen, while the dasher revolves, add fruit through the fruit funnel. The mix may be curdled if fruit is added to it before it is partly frozen and whole fruit is unnecessarily crushed.

With Milk Solids Restored

Where state law fixes a standard for Ice-Cream, and does not provide for a decrease in milk fat percentage when fruit is added, use the tables "With Milk Solids Restored" on pages 275 and 276 and proceed in the same way.

Without Restoring Milk Solids.

In states having no legal Ice-Cream standard, simply add the fruit to the regular vanilla mix in the proportions provided in the tables on pages 278 and 279, and add the flavor and color in the manner provided above.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit with Milk Fat Reduced[1]

6% Milk Fat reduced from 8%—Standard in Ala., Ark., Conn., N. J., Pa., and Tex.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways and to fresh fruits, see page 280.)

	Ingredients to be combined to make 6% fruit mix	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.)[2]	Calculated weight per gallon of fruit mix at 68 degrees F.	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 8% vanilla mix	74.50	3 gals.6½ pts.	76 gals. 3 pts.	44.89	9.307	4.986
	Strawberries, raspb., blackb., or loganb.	18.80	7 pts.	17½ gals.			
	Skim milk	3.83	1¾ pts.	4 gals. 1¼ pts.			
	Powdered skim milk	2.87	1 lb. 5½ oz.	26 lbs. 11 oz.			
	Regular 8% vanilla mix	74.46	3 gals.6½ pts.	76 gals. 2¾ pts	44.88	9.308	4.986
	Strawberries, blackb., raspb., or loganb.	18.80	7 pts.				
	Powdered skim milk	3.25	1 lb. 8¼ oz.	30 lbs. 2 oz.			
	Water	3.49	1½ pts.	3 gals. 7¼ pts			
II	Regular 8% vanilla mix	74.52	3 gals.6½ pts.	76 gals. ¼ pt.	42.36	9.265	4.963
	Peaches, grapes, apricots or pears	16.45	6 pts.	15¼ gals.			
	Skim milk	6.41	2¾ pts.	6 gals. 7¼ pts			
	Powdered skim milk	2.62	1 lb. 3½ oz.	24¼ lbs.			
	Regular 8% vanilla mix	74.46	3 gals.6½ pts.	76 gals.	42.35	9.267	4.965
	Peaches, grapes, apricots or pears	16.45	6 pts.	15¼ gals.			
	Powdered skim milk	3.25	1½ lbs.	30 lbs. 2 oz.			
	Water	5.84	2½ pts.	6½ gals.			
III	Regular 8% vanilla mix	74.81	3 gals.6¼ pts.	75 gals. 7¾ pts.	40.29	9.222	4.94
	Pineapple or plums	14.10	5¼ pts.	13 gals.			
	Condensed skim milk (3 to 1)	11.09	4½ pts.	11 gals. ¼ pt.			
	Regular 8% vanilla mix	74.46	3 gals.6¼ pts.	75 gals. 2¼ pts.	40.24	9.227	4.943
	Pineapple or plums	14.10	5¼ pts.	13 gals.			
	Powdered skim milk	3.25	1½ lbs.	30 lbs.			
	Water	8.19	3½ pts.	9 gals. ¾ pts.			
IV	Regular 8% vanilla mix	74.60	3¾ gals.	75 gals. 1 pt.	35.89	9.142	4.897
	Cherries	9.40	3½ pts.	8 gals. 4¾ pts.			
	Skim milk	14.13	6 pts.	15 gals.			
	Powdered skim milk	1.87	13¾ oz.	17 lbs. 2 oz.			
	Regular 8% vanilla mix	74.46	3¾ gals.	75 gals.	35.87	9.147	4.9
	Cherries	9.40	3½ pts.	8 gals. 4¾ pts.			
	Powdered skim milk	3.25	1½ lbs.	29¾ lbs.			
	Water	12.89	5½ pts.	14 gals. 1¼ pts.			

[1]The milk-solids-not-fat, swell and yield are those for the 6% mix shown in table on page 17.

[2]Fruit solids included in these total solids are the average for the fruits specified. These vary, but the extreme variation would not change the percentages given more than 0.78—a difference so slight that it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit With Milk Fat Reduced[1]

8% Milk Fat reduced from 10%—Standard in Cal., Ky., La., Md., Ore.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways, and to fresh fruit, see page 280.)

	Ingredients to be combined to make 8% fruit mix	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids (per cent.)[2]	Calculated weight per gallon of fruit mix at 68 degrees F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 10% vanilla mix	76.90	3 gals. 7½ pts.	79 gals. ½ pt.			
	Strawberries, raspb., blackb., or loganb.	19.40	7¼ pts.	18 gals. ¼ pt.	47.08	9.292	4.891
	Cream, 18 per cent	0.91	½ pt.	1 gal. ¼ pt.			
	Powdered skim milk	2.79	1 lb. 5 oz.	25 lbs. 15 oz.			
	Regular 10% vanilla mix	77.58	4 gals.	79¾ gals.			
	Strawberries, raspb., blackb., or loganb.	19.40	7¼ pts.	18 gals.	47.17	9.29	4.889
	Unsalted butter	0.24	2 oz.	2¼ lbs.			
	Powdered skim milk	2.78	1 lb. 4¾ oz.	25 lbs. 15 oz.			
II	Regular 10% vanilla mix	79.66	4 gals. ¾ pt.	81 gals. 5 pts.			
	Peaches, grapes, apricots or pears	16.98	6¼ pts.	15 gals. 5¾ pts.	44.86	9.258	4.873
	Skim milk	0.87	½ pt.	7½ pts.			
	Powdered skim milk	2.49	1 lb. 2½ oz.	23 lbs. 1 oz.			
	Regular 10% vanilla mix	79.66	4 gals. ¾ pt.	81 gals. 5 pts.			
	Peaches, grapes, apricots or pears	16.98	6¼ pts.	15 gals. 5¾ pts.	44.86	9.259	4.873
	Powdered skim milk	2.58	1 lb. 3½ oz.	23 lbs. 15 oz.			
	Water	0.78	½ pt.	7 pts.			
III	Regular 10% vanilla mix	79.69	4 gals. ½ pt.	81 gals. 2¼ pts.			
	Pineapple or plums	14.55	5¼ pts.	13 gals. 3¼ pts.	42.68	9.215	4.85
	Skim milk	3.53	1½ pts.	3 gals. 6¼ pts.			
	Powdered skim milk	2.23	1 lb. ½ oz.	20 lbs. 9 oz.			
	Regular 10% vanilla mix	79.66	4 gals. ½ pt.	81¼ gals.			
	Pineapple or plums	14.55	5¼ pts.	13 gals. 3¼ pts.	42.68	9.217	4.851
	Powdered skim milk	2.58	1 lb. 3 oz.	23 lbs. 13 oz.			
	Water	3.21	1½ pts.	3 gals. 4½ pts.			
IV	Regular 10% vanilla mix	79.73	4 gals. ¼ pt.	80 gals. 4½ pts			
	Cherries	9 70	3½ pts.	8 gals. 6¾ pts	38 18	9 131	4 806
	Skim milk	8.85	3¾ pts.	9 gals. 3¼ pts.			
	Powdered skim milk	1.72	13½ oz.	15 lbs. 11 oz.			
	Regular 10% vanilla mix	79.66	4 gals. ¼ pt.	80 gals. 4¾ pts			
	Cherries	9.70	3½ pts.	8 gals. 6¾ pts	38 17	9.135	4.808
	Powdered skim milk	2.58	1 lb. 3 oz.	23 lbs. 9 oz.			
	Water	8.06	3½ pts.	8 gals. 6¾ pts			

[1]The milk-solids-not-fat, swell and yield are those for the 8% mix shown in table on page 17.

[2]Fruit solids in these total solids are the averages for the fruits specified. They vary, but the extreme variation would not change the percentages given more than 0.78—a difference so slight it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit With Milk Fat Reduced[1]

9% Milk Fat, reduced from 10%—Standard for Montana.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways and fresh fruit, see page 280).

	Ingredients	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.)[2]	Calculated weight per gallon of fruit mix at 68 degrees F.	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 10% vanilla mix	71.49	3 gals.5¼ pts.	73 gals. 2¼ pts.			
	Strawberries, blackb., raspb., or loganb	19.70	7¼ pts.	18¼ gals.	47.38	9.261	4.831
	Cream, 30%	6.06	2¾ pts.	6 gals. 5¾ pts.			
	Powdered skim milk	2.75	1 lb. 4½ oz.	25½ lbs.			
II	Regular 10% vanilla mix	75.66	3 gals. 7 pts.	77¼ gals.			
	Peaches, grapes, apricots or pears	17.24	6½ pts.	15 gals. 7¼ pts	45.32	9.226	4.814
	Cream, 30%	4.68	1¾ pts.	5 gals. 1½ pts			
	Powdered skim milk	2.42	1 lb. 2 oz.	22 lbs. 5 oz.			
III	Regular 10% vanilla mix	74.72	3 gals.6½ pts.	75 gals. 7¼ pts.			
	Pineapple or plums	14.78	5½ pts.	13 gals. 4½ pts.	42.97	9.178	4.789
	Cream, 18%	8.33	3¾ pts.	9 gals. ½ pt.			
	Powdered skim milk	2.17	15 oz.	19 lbs. 15 oz.			
IV	Regular 10% vanilla mix	87.34	4 gals.3½ pts.	86½ gals.			
	Cherries	9.85	3½ pts.	9 gals.	41.17	9.155	4.776
	Cream, 18%	1.37	¾ pt.	1½ gals.			
	Powdered skim milk	1.44	10½ oz.	13 lbs. 3 oz.			

[1]The milk-solids-not-fat, swell and yield are those shown in the table on page 17 for the standard of mix made.

[2]Fruit solids included in these total solids are the averages for the fruits specified. These vary, but the extreme variations would not change the percentages given more than 0.78—a difference so slight that it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit With Milk Fat Reduced[1]

10% Milk Fat reduced from 12%—Standard in Iowa, Mich., Minn., N. Dak. and Wisc.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways and to fresh fruit, see page 280.)

	Ingredients to be combined to make 10% fruit mix	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.)[2]	Calculated weight per gallon of fruit mix at 68 degrees F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 12% vanilla mix	73.25	3¾ gals.	75¼ gals.			
	Strawberries, blackb., raspb., or loganb.	20.00	7¼ pts.	18 gals. 3¾ pts.	48.43	9.239	4.778
	Cream, 30%	3.91	1¾ pts.	4 gals. 2¾ pts.			
	Powdered skim milk	2.84	1 lb. 5 oz.	26¼ lbs.			
	Regular 12% vanilla mix	76.18	3 gals. 7¼ pts.	78 gals. 3 pts.			
	Strawberries, blackb., raspb., or loganb.	20.00	7¼ pts.	18½ gals.	48.83	9.254	4.786
	Unsalted butter	0.99	7½ oz.	9 lbs. 3 oz.			
	Powdered skim milk	2.83	1 lb. 5 oz.	26 lbs. 3 oz.			
II	Regular 12% vanilla mix	73.70	3 gals. 6¼ pts.	75 gals. 2¾ pts.			
	Peaches, grapes, apricots or pears	17.50	6½ pts.	16 gals. ¾ pt.	45.80	9.197	4.757
	Cream, 18%	6.23	2¾ pts.	6 gals. 6¼ pts.			
	Powdered skim milk	2.57	1 lb. 3 oz.	23 lbs. 11 oz.			
	Regular 12% vanilla mix	79.47	4 gals. 1½ pts.	81½ gals.			
	Peaches, grapes, apricots, pears	17.50	6½ pts.	16 gals. 1¼ pts	46.59	9.226	4.772
	Unsalted butter	0.52	4 oz.	4 lbs. 13 oz.			
	Powdered skim milk	2.51	1 lb. 2½ oz.	23 lbs. 3 oz.			
II	Regular 12% vanilla mix	82.25	4 gals. 1¾ pts.	84 gals. ¾ pt.			
	Pineapple or plums	15.00	5½ pts.	13 gals. 6¼ pts.	44.72	9.196	4.757
	Cream, 18 per cent	0.56	¼ pt.	5 pts.			
	Powdered skim milk	2.19	1 lb. ¼ oz.	20 lbs. 3 oz.			
	Regular 12% vanilla mix	82.77	4 gals. 1¾ pts.	84¼ gals.			
	Pineapple or plums	15.00	5½ pts.	13 gals. 6¼ pts	44.80	9.199	4.758
	Unsalted butter	0.05	½ oz.	½ lb.			
	Powdered skim milk	2.18	1 lb.	20 lbs. 2 oz.			
IV	Regular 12% vanilla mix	83.13	4 gals. 1¾ pts.	84 gals. 1¾ pts.			
	Cherries	10.00	3¾ pts.	9 gals. 1 pt.	40.19	9.113	4.714
	Skim milk	5.25	2¼ pts.	5 gals. 4½ pts.			
	Powdered skim milk	1.62	11¾ oz.	14¾ lbs.			
	Regular 12% vanilla mix	83.10	4 gals. 1¾ pts.	84 gals. 1¾ pts.			
	Cherries	10.00	3¾ pts.	9 gals. 1 pt.	40.18	9.116	4.715
	Powdered skim	2.15	15¾ oz.	19 lbs. 10 oz.			
	Water	4.75	2 pts.	5 gals. 1½ pts.			

[1]The milk-solids-not-fat, swell and yield are those of the 10% mix shown in table on page 17.

[2]Fruit solids included in these total solids are the average for the fruits specified. These vary, but the extreme variation would not change the percentages given more than 0.78—a differnece so slight that it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit With Milk Fat Reduced[1]

12% Milk Fat, reduced from 14%—Standard in Alaska, Canal Z., Fla., Guam, Hawaii, Ida., Me., Neb., Nev., Okla., Phil. Is., Pto. Rico., S. Dak., Utah. Vt., and under federal (U. S.) statutes.

For fruits most generally used, cold packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways and to fresh fruit, see page 280).

	Ingredients to be combined to make 12 % fruit mix	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.)[2]	Calculated weight per gallon of fruit mix at 68 degrees F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 14% vanilla mix	71.83	3 gals.5½ pts.	73 gals. 6½ pts.			
	Strawberries, blackb., raspb., or loganb.	20.60	7½ pts.	18 gals. 7½ pts.	50.08	9.201	4.679
	Cream, 40 per cent.	4.77	2¼ pts.	5 gals. 2½ pts.			
	Powdered skim milk	2.80	1 lb. 4¾ oz.	25¾ lbs.			
	Regular 14% vanilla mix	74.75	3 gals.6¾ pts.	76 gals. 5½ pts.			
	Strawberries, blackb., raspb., or loganb.	20.60	7½ pts.	18 gals. 8¾ pts.	50.48	9.215	4.686
	Unsalted butter	1.81	13½ oz.	16 lbs. 11 oz.			
	Powdered skim milk	2.84	1 lb. 5 oz.	26 lbs. 3 oz.			
II	Regular 14% vanilla mix	74.18	3 gals.6¼ pts.	75 gals. 7¾ pts.			
	Peaches, grapes, apricots, pears	18.03	6¾ pts.	16 gals. 4¼ pts.	47.64	9.169	4.657
	Cream, 30 per cent.	5.27	2½ pts.	5 gals. 6¼ pts.			
	Powdered skim milk	2.52	1 lb. 2½ oz.	23 lbs. 2 oz.			
	Regular 14% vanilla mix	78.24	4 gals. ¼ pt.	80 gals.			
	Peaches, grapes, apricots, pears	18 03	6¾ pts.	16 gals. 4½ pts.	48.18	9.178	4.667
	Unsalted butter	1.22	8¾ oz.	11 lbs. 3 oz.			
	Powdered skim milk	2.51	1 lb. 2½ oz.	23 lbs. 1 oz.			
III	Regular 14% vanilla mix	80.60	4 gals.1¼ pts.	82½ gals.			
	Pineapple or plums	15.45	5¾ pts.	14 gals. 1¼ pts.	46.16	9.155	4.655
	Cream, 40%	1.69	¾ pt.	1 gal. 7 pts.			
	Powdered skim milk	2.18	1 lb.	19 lbs. 15 oz.			
	Regular 14% vanilla mix	81.72	4 gals.1¼ pts.	83 gals. 4¾ pts.			
	Pineapple or plums	15.45	5¾ pts.	14 gals. 1¼ pts.	46.33	9.159	4.657
	Unsalted butter	0.64	4¾ oz.	5 lbs. 14 oz.			
	Powdered skim milk	2.19	1 lb.	20 lbs. 14 oz.			
IV	Regular 14% vanilla mix	85.56	4 gals.2¾ pts.	86 gals. 7 pts.			
	Cherries	10.30	3¾ pts.	9 gals. 2¾ pts.	42.04	9.089	4.621
	Skim milk	2.56	1 pt.	2 gals. 6½ pts.			
	Powdered skim milk	1.58	11½ oz.	14 lbs. 6 oz.			
	Regular 14% vanilla mix	85.54	4 gals.2¾ pts.	87 gals. 1½ pts.			
	Cherries	10.30	3¾ pts.	9 gals. 3¼ pts.	42.04	9.125	4.64
	Powdered skim milk	1.83	13½ oz.	16 lbs. 11 oz.			
	Water	2.33	¾ pt.	2 gals. 1¼ pts.			

[1]The milk-solids-not-fat, swell and yield are those of the 12 per cent mix shown in table on page 17.

[2]Fruit solids included in these total solids are the average for the fruits specified. These vary, but the extreme variation would not change the percentages given more than 0.78—a difference so slight that it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit (2 to 1) With Milk Solids Restored

7% Milk Fat—Standard for Mass.
8% Milk Fat—Standard for D. C., Ga., Ill., Ind., Miss., Mo., N. C., N. Y., O., R. I., Va., and Wash.
10% Milk Fat—Standard for Ariz., Colo., Kan., Wyo.
14% Milk Fat—Standard for N. H.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. For method of applying this table to fruits packed in other ways and fresh fruits, see page 280.

Standard of Fruit Ice-Cream (per cent. milk fat)	Ingredients to be combined to make fruit mix	Quantity for 100-pound mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.[2])	Calculated weight per gallon of fruit mix at 68° F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream (pounds)
7	Regular 7% vanilla mix	76.33	3 gals. 7¼ pts.	78 gals. ¾ pt.			
	Strawberries, raspb., blackb., or loganb.	19.10	7¼ pts.	17 gals. 6¼ pts.	46.37	9.31	4.943
I	Unsalted butter	1.96	14¾ oz.	18 lbs. 5 oz.			
	Powdered skim milk	2.61	1 lb. 3½ oz.	25 lbs. 5 oz.			
	Regular 7% vanilla mix	79.29	4 gals. ½ pt.	80 gals. 7¼ pts.			
	Peaches, grapes, apricots or pears	16.71	6¼ pts.	15½ gals.	44.23	9.283	4.929
II	Unsalted butter	1.71	13 oz.	15 lbs. 14 oz.			
	Powdered skim milk	2.29	1 lb. 2 oz.	22 lbs. 6 oz.			
	Regular 7% vanilla mix	82.24	4 gals. 1½ pts.	83 gals. 5¼ pts.			
III	Pineapple or plums	14.33	5¼ pts.	13 gals. 2¼ pts.	42.52	9.257	4.915
	Unsalted butter	1.47	11 oz.	13 lbs. 10 oz.			
	Powdered skim milk	1.96	14½ oz.	18 lbs. 3 oz.			
	Regular 7% vanilla mix	88.16	4 gals. 3¾ pts.	89 gals. 1¼ pts.			
	Cherries	9.55	3½ pts.	8 gals. 6¼ pts.	38.94	9.204	4.887
IV	Unsalted butter	0.98	7¼ oz.	9 lbs. 1 oz.			
	Powdered skim milk	1.31	9¾ oz.	12 lbs. 2 oz.			
8	Regular 8% vanilla mix	75.66	3 gals. 7 pts.	77 gals. 3½ pts.			
	Strawberries, raspb., blackb., or loganb.	19.40	7¼ pts.	18 gals.	47.17	9.291	4.89
I	Unsalted butter	2.31	1 lb. 1¼ oz.	21½ lbs.			
	Powdered skim milk	2.63	1 lb. 3½ oz.	24 lbs. 7 oz.			
	Regular 8% vanilla mix	78.70	4 gals. ¼ pts.	80 gals. 2½ pts.			
	Peaches, grapes, apricots, or pears	16.98	6¼ pts.	15¾ gals.	45.01	9.264	4.876
II	Unsalted butter	2.02	15 oz.	18¾ lbs.			
	Powdered skim milk	2.30	1 lb. 1 oz.	21 lbs. 5 oz.			
	Regular 8% vanilla mix	81.75	4 gals. 1¼ pts.	83 gals. 1½ pts.			
	Pineapple or plums	14.55	5½ pts.	13 gals. 3½ pts.	43.26	9.233	4.86
III	Unsalted butter	1.73	13 oz.	16 lbs.			
	Powdered skim milk	1.97	14½ oz.	18 lbs. 3 oz.			
	Regular 8% vanilla mix	87.82	4 gals. 3½ pts.	88 gals. 6¾ pts.			
	Cherries	9.70	3½ pts.	8 gals. 7¼ pts.	39.63	9.184	4.834
IV	Unsalted butter	1.16	8¾ oz.	10 lbs. 11 oz.			
	Powdered skim milk	1.32	9¾ oz.	12 lbs. 1 oz.			

[1]The milk-solids-not-fat, swell and yield are those shown in the table on page 17 for the standard of mix made.

[2]Fruit-solids included in these total solids are the average for the fruits specified. These vary, but the extreme variation would not change the percentages given more than 0.78—a difference so slight that it has no appreciable effect on practical results.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit (2 to 1) With Milk Solids Restored[1]

10% Milk Fat—Standard for Ariz., Colo., Kan.,[3] Wyo.

14% Milk Fat—Standard for N. H.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. For method of applying this table to fruits packed in other ways and fresh fruits, see page 280.

Standard of fruit Ice-Cream (per cent. milk fat)	Ingredients to be combined to make fruit mix	Quantity for 100-pound mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.[2])	Calculated weight per gallon of fruit mix at 68° F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream (pounds)
10	Regular 10% vanilla mix	74.29	3 gals. 6½ pts.	76 gals. 1 pt.			
I	Strawberries, raspb., blackb., loganb.	20.00	7½ pts.	18½ gals.	48.76	9.252	4.786
	Unsalted butter	3.06	1 lb. 6¾ oz.	28 lbs. 5 oz.			
	Powdered skim milk	2.65	1 lb. 3¾ oz.	24 lbs. 9 oz.			
	Regular 10% vanilla	77.50	3 gals. 7¾ pts.	79 gals. 1 pt.			
II	Peaches, grapes, apricots, or pears	17.50	6½ pts.	16 gals. 1¼ pts.	46.60	9.224	4.771
	Unsalted butter	2.68	1¼ lbs.	24¾ lbs.			
	Powdered skim milk	2.32	1 lb. 1½ oz.	21 lbs. 7 oz.			
	Regular 10% vanilla mix	80.71	4 gals. 1 pt.	82 gals. 2½ pts.			
III	Pineapple or plums	15.00	5½ pts.	13 gals. 6½ pts.	44.80	9.215	4.767
	Unsalted butter	2.30	1 lb. 1 oz.	21¼ lbs.			
	Powdered skim milk	1.99	14¾ oz.	18 lbs. 6 oz.			
	Regular 10% vanilla mix	87.14	4 gals. 3¼ pts	88 gals. 1½ pts.			
IV	Cherries	10.00	3¾ pts.	9 gals. 1¼ pts.	41.06	9.143	4.729
	Unsalted butter	1.53	11¼ oz.	14 lbs.			
	Powdered skim milk	1.33	9¾ oz.	12 lbs. 3 oz.			
	Regular 14% vanilla mix	71.31	3 gals. 5¼ pts.	73 gals. ¾ pt.			
I	Strawberries, raspb., blackb., or loganb.	21.20	7¾ pts.	19 gals. 3¾ pts.	52.15	9.178	4.589
14	Unsalted butter	4.80	2 lbs. 3¼ oz.	44 lbs. 1 oz.			
	Powdered skim milk	2.69	1 lb. 3¾ oz.	24 lbs. 11 oz.			
	Regular 14% vanilla mix	74.90	3 gals 6½ pts.	76 gals. 4¼ pts.			
II	Peaches, grapes, apricots or pears	18.55	6¾ pts.	16 gals. 7¾ pts.	49.78	9.149	4.574
	Unsalted butter	4.20	1 lb. 14¾ oz.	38 lbs. 7 oz.			
	Powdered skim milk	2.35	1 lb. 1¼ oz.	21½ lbs.			
	Regular 14% vanilla mix	78.48	4 gals.	79 gals. 7½ pts.			
III	Pineapple or plums	15.90	5¾ pts.	14½ gals.	47.87	9.121	4.56
	Unsalted butter	3.60	1 lb. 10½ oz.	32 lbs. 14 oz.			
	Powdered skim milk	2.02	14¾ oz.	18 lbs. 6¾ oz.			
	Regular 14% vanilla mix	85.66	4 gals. 2¾ pts.	86 gals. 5¾ pts.			
IV	Cherries	10.60	3¾ pts.	9 gals. 4¾ pts.	43.90	9.064	4.532
	Unsalted butter	2.40	1 lb. 1¼ oz.	21¾ lbs.			
	Powdered skim milk	1.34	9¾ oz.	12 lbs. 3 oz.			

[1]The milk-solids-not-fat, swell and yield are those shown in the table on page 17 for the standard of mix made.

[2]Fruit-solids included in these total solids are the average for the fruits specified. These vary, but the extreme variation would not change the percentages given more than 0.78—a difference so slight that it has no appreciable effect on practical results.

[3]In Kansas, draw this mix when swell is at 92.48 per cent., to obtain the required weight of 4.75 pounds per gallon.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit with Part of Milk Solids Restored[1]

8% Milk Fat, with such reduction of the percentage of milk-fat and milk-solids-not-fat as is due to the addition of fruit. Standard for Tenn.

For fruits most generally used, cold-packed, 2 pounds of fruit to 1 pound of sugar. (For method of applying this table to fruits packed in other ways and fresh fruits, see page 280.

	Ingredients	Quantity for 100-lb. mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in fruit mix (per cent.)	Calculated weight per gallon of fruit mix at 68 degrees F. (pounds)	Calculated weight per gallon of frozen fruit Ice-Cream when drawn (pounds)
I	Regular 8% vanilla mix	77.55	3 gals. 7½ pts.	79 gals. ¼ pt.	44.96	9.254	4.87
	Strawberries, blackb., raspb., or loganb	19.40	7¼ pts.	17 gals. 7½ pts.			
	Cream, 30%	2.17	1 pt.	2 gals. 3¼ pts.			
	Powdered skim milk	0.88	6½ oz.	8 lbs. 1 oz.			
II	Regular 8% vanilla mix	79.94	4 gals. ½ pt.	81¼ gals.	43.09	9.229	4.857
	Peaches, grapes, apricots, or pears	16.98	6¼ pts.	15 gals. 5¼ pts.			
	Cream, 30%	2.30	1 pt.	2 gals. 4¼ pts.			
	Powdered skim milk	0.78	5¾ oz.	7 lbs. 3 oz.			
III	Regular 8% vanilla mix	80.37	4 gals. ½ pt.	81 gals. 3 pts.	41.26	9.194	4.839
	Pineapple or plums	14.55	5¼ pts.	13 gals. 3 pts.			
	Cream, 18%	4.36	2 pts.	4¾ gals.			
	Powdered skim milk	0.72	5¼ oz.	6 lbs. 10 oz.			
IV	Regular 8% vanilla mix	86.86	4 gals. 3 pts.	87 gals. 4¾ pts.	38.30	9.156	4.819
	Cherries	9.70	3½ pts.	8 gals. 7 pts.			
	Cream, 18%	2.95	1¼ pts.	3 gals. 1½ pts.			
	Powdered skim milk	0.49	3½ oz.	4½ lbs.			

[1]The milk fat in these fruit mixes is: I, 7.48%; II, 7.22%; III, 7.09%; IV, 6.86%. The milk-solids-not-fat are: I, 9.81%; II, 9.46%; III, 9.29%; IV, 9.13%.

The decrease in milk solids below the standard for 8 per cent. Ice-Cream (in table on page 17) is due solely to the addition of fruit, those lost by the addition of sugar with the fruit being restored.

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit Without Restoring Milk Solids

The standard of the resulting Ice-Cream must be kept in mind to avoid possible violations of law.

1.—Strawberries, raspberries, blackberries, loganberries—cold pack, 2 to 1. For method of applying tables to cold-pack fruit with other proportions of sugar and to fresh fruit, see page 280.

Std. of Vanilla Ice-Crm. mix (per cent. milk fat)	100-pound mix		5-gallon mix		100-gallon mix		Standard of resulting Fruit Ice-Cream		
	Quantity regular vanilla mix (pounds)	Quantity of fruit (pounds)	Quantity of regular vanilla mix	Quantity of fruit (pints)	Quantity of regular vanilla mix	Quantity of fruit	Milk fat (per cent.)	Milk solids not fat (per cent.)	Granulated sugar solids (per cent.)
2.40	82.28	17.72	4 gals. 1½ pts.	6½	83 gals. 4½ pts.	16 gals. 3½ pts.	1.97	9.61	18.50
3.50	81.95	18.05	4 gals. 1¼ pts.	6¾	83 gals. 2½ pts.	16 gals. 5½ pts.	2 87	9.38	18.11
4	81.80	18.20	4 gals. 1¼ pts.	6¾	83 gals. 1½ pts.	16 gals. 6½ pts.	3.27	9.27	18.04
5	81.50	18.50	4 gals. 1¼ pts.	6¾	82 gals. 7½ pts.	17 gals. ½ pt.	4.07	9.06	17.95
6	81.20	18.80	4 gals. 1 pt.	7	82 gals. 5¾ pts.	17 gals. 2¼ pts.	4.87	8.85	17.84
7	80.90	19.10	4 gals. 1 pt.	7	82 gals. 3¾ pts.	17 gals. 4¼ pts.	5.66	8.65	17.74
8	80.60	19.40	4 gals. 1 pt.	7	82 gals. 1¾ pts.	17 gals. 6¼ pts.	6.45	8.44	17.72
9	80.30	19.70	4 gals. ¾ pt.	7¼	82 gals.	18 gals.	7.23	8.25	17.64
10	80	20	4 gals. ¾ pt.	7¼	81¾ gals.	18¼ gals.	8	8.04	17.57
11	79.70	20.30	4 gals. ½ pt.	7½	81½ gals.	18½ gals.	8.77	7.84	17.49
12	79.40	20.60	4 gals. ½ pt.	7½	81 gals. 2¼ pts.	18 gals. 5¾ pts.	9.53	7.67	17.42
13	79.10	20.90	4 gals. ½ pt.	7½	81 gals. ½ pt.	18 gals. 7½ pts.	10.28	7.46	17.32
14	78.80	21.20	4 gals. ¼ pt.	7¾	80 gals. 6½ pts.	19 gals. 1½ pts.	11.03	7.25	17.27
15	78.50	21.50	4 gals. ¼ pt.	7¾	80 gals. 4½ pts.	19 gals. 3½ pts.	11.77	7.05	17.20
16	78.20	21.80	4 gals. ¼ pt.	7¾	80 gals. 2¾ pts.	19 gals. 5¼ pts.	12.51	6.86	17.14
17	77.90	22.10	4 gals.	8	80 gals. ¾ pt.	19 gals. 7¼ pts.	13.24	6.67	17.07
18	77.60	22.40	4 gals.	8	79 gals. 7 pts.	20 gals. 1 pt.	13.98	6.48	17
19	77.30	22.70	3 gals. 7¾ pts.	8¼	79 gals. 5¼ pts.	20 gals. 2¾ pts.	14.69	6.30	16.94
20	77.	23.	3 gals. 7¾ pts.	8¼	79 gals. 3¼ pts.	20 gals. 4¾ pts.	15.40	6.11	16.87

2.—Peaches, grapes, apricots, pears—Cold pack, 2 to 1: that is, 2 lbs. of fruit to 1 lb. of sugar.

Std. of Vanilla Ice-Crm. mix (per cent. milk fat)	100-pound mix		5-gallon mix		100-gallon mix		Standard of resulting Fruit Ice-Cream Mix		
	Quantity regular vanilla mix (pounds)	Quantity of fruit (pounds)	Quantity of regular vanilla mix	Quantity of fruit (pints)	Quantity of regular vanilla mix	Quantity of fruit	Milk fat (per cent.)	Milk solids not fat (per cent.)	Granulated sugar solids (per cent.)
2.40	84.49	15.51	4 gals. 2¼ pts.	5¾	85 gals. 5 pts.	14 gals. 3 pts.	2.03	9.87	17.77
3.50	84.20	15.80	4¼ gals.	6	85 gals. 3 pts.	14 gals. 5 pts.	2.95	9.63	17.70
4	84.07	15.93	4¼ gals.	6	85 gals. 2¼ pts.	14 gals. 5¾ pts.	3.36	9.53	17.62
5	83 81	16.19	4¼ gals.	6	85 gals. ¾ pt.	14 gals. 7¼ pts.	4.19	9.32	17.52
6	83.55	16.45	4¼ gals.	6	84 gals. 7 pts.	15 gals. 1 pt.	5.01	9.11	17.40
7	83.29	16.71	4 gals. 1¾ pts.	6¼	84 gals. 5¼ pts.	15 gals. 2¾ pts.	5.83	8.90	17.34
8	83.02	16.98	4 gals. 1¾ pts.	6¼	84 gals. 3½ pts.	15 gals. 4½ pts.	6.64	8.69	17.26
9	82.76	17.24	4 gals. 1¾ pts.	6¼	84¼ gals.	15¾ gals.	7.45	8.50	17.16
10	82.50	17.50	4 gals. 1½ pts.	6½	84 gals. ½ pt.	15 gals. 7¾ pts.	8.25	8.29	17.08
11	82.24	17.76	4 gals. 1½ pts.	6½	83 gals. 6½ pts.	16 gals. 1½ pts.	9.05	8.09	16.99
12	81.97	18.03	4 gals. 1½ pts.	6½	83 gals. 5 pts.	16 gals. 3 pts.	9.76	7.91	16.91
13	81.71	18.29	4 gals. 1¼ pts.	6¾	83 gals. 3¼ pts.	16 gals. 4¾ pts.	10.62	7.70	16.80
14	81.45	18.55	4 gals. 1¼ pts.	6¾	83 gals. 1½ pts.	16 gals. 6½ pts.	11.40	7.49	16.74
15	81.19	18.81	4 gals. 1¼ pts.	6¾	83 gals.	17 gals.	12.18	7.29	16.65
16	80.92	19.08	4 gals. 1 pt.	7	82 gals. 6½ pts.	17 gals. 1¼ pts.	12.95	7.10	16.58
17	80.66	19.34	4 gals. 1 pt.	7	82 gals. 4¾ pts.	17 gals. 3½ pts.	13.71	6.91	16.50
18	80.40	19.60	4 gals. 1 pt.	7	82 gals. 3¼ pts.	17 gals. 4¾ pts.	14.47	6.71	16.41
19	80.14	19.86	4 gals. ¾ pt.	7¼	82 gals. 1½ pts.	17 gals. 6½ pts.	15.23	6.53	16.34
20	79.87	20.13	4 gals. ¾ pt.	7¼	82 gals.	18 gals.	15.97	6.34	16.26

FRUIT ICE-CREAM

Using Regular Vanilla Mix and Cold Pack Fruit Without Restoring Milk Solids

The Standard of the resulting Ice-Cream must be kept in mind to avoid possible violations of law.

3.—Pineapple, plums—cold pack, 2 to 1.

For method of applying tables to cold-pack fruit with other proportions of sugar and to fresh fruit, see page 280.

Std. of Vanilla Ice-Crm. mix (per cent. milk fat)	100-pound mix		5-gallon mix		100-gallon mix		Standard of resulting Fruit Ice-Cream		
	Quantity regular vanilla mix (pounds)	Quantity of fruit (pounds)	Quantity of regular vanilla mix	Quantity of fruit (pints)	Quantity of regular vanilla mix	Quantity of fruit	Milk fat (per cent.)	Milk solids not fat (per cent.)	Granulated sugar solids (per cent.)
2.40	86.71	13.29	4 gals. 3 pts.	5	87 gals. 5½ pts.	12 gals. 2½ pts.	2.08	10.12	17.36
3.50	86.46	13.54	4 gals. 3 pts.	5	87 gals. 4¼ pts.	12 gals. 3¾ pts.	3.03	9.89	17.27
4	86.35	13.65	4 gals. 3 pts.	5	87 gals. 3¾ pts.	12 gals. 4¼ pts.	3.45	9.78	17.20
5	86.12	13.88	4 gals. 3 pts.	5	87 gals. 1¾ pts.	12 gals. 6¼ pts.	4.31	9.57	17.09
6	85.90	14.10	4 gals. 2¾ pts.	5¼	87 gals. ¼ pt.	12 gals. 7¾ pts.	5.15	9.36	16.97
7	85.67	14.33	4 gals. 2¾ pts.	5¼	86 gals. 6¾ pts.	13 gals. 1¼ pts.	6.00	9.16	16.89
8	85.45	14.55	4 gals. 2¾ pts.	5¼	86 gals. 5¼ pts.	13 gals. 2¾ pts.	6.84	8.95	16.79
9	85.22	14.78	4 gals. 2½ pts.	5½	86½ gals.	13½ gals.	7.67	8.75	16.71
10	85	15	4 gals. 2½ pts.	5½	86 gals. 2½ pts.	13 gals. 5½ pts.	8.50	8.54	16.59
11	84.77	15.23	4 gals. 2½ pts.	5½	86 gals. 1 pt.	13 gals. 7 pts.	9.33	8.34	16.50
12	84.55	15.45	4 gals. 2½ pts.	5½	85 gals. 7¾ pts.	14 gals. ¼ pt.	10.10	8.16	16.40
13	84.32	15.68	4 gals. 2¼ pts.	5¾	85 gals. 6¼ pts.	14 gals. 1¾ pts.	10.96	7.95	16.31
14	84.10	15.90	4 gals. 2¼ pts.	5¾	85 gals. 4¾ pts.	14 gals. 3¼ pts.	11.77	7.74	16.21
15	83.87	16.13	4 gals. 2¼ pts.	5¾	85 gals. 3½ pts.	14 gals. 4½ pts.	12.58	7.53	16.11
16	83.65	16.35	4¼ gals.	6	85¼ gals.	14¾ gals.	13.38	7.34	16.02
17	83.42	16.58	4¼ gals.	6	85 gals. ¾ pt.	14 gals. 7¼ pts.	14.18	7.14	15.96
18	83.20	16.80	4¼ gals.	6	84 gals. 7¼ pts.	15 gals. ¾ pt.	14.98	6.95	15.83
19	82.97	17.03	4¼ gals.	6	84 gals. 5¾ pts.	15 gals. 2¼ pts.	15.77	6.76	15.75
20	82.75	17.25	4 gals. 1¾ pts.	6¼	84 gals. 4½ pts.	15 gals. 3½ pts.	16.55	6.56	15.65

4.—Cherries—cold pack, 2 to 1; that is 2 lbs. of fruit to 1 lb. of sugar.

Std. of Vanilla Ice-Crm. mix (per cent. milk fat)	100-pound mix		5-gallon mix		100-gallon mix		Standard of resulting Fruit Ice-Cream		
	Quantity regular vanilla mix (pounds)	Quantity of fruit (pounds)	Quantity of regular vanilla mix	Quantity of fruit (pints)	Quantity of regular vanilla mix	Quantity of fruit	Milk fat (per cent.)	Milk solids not fat (per cent.)	Granulated sugar solids (per cent.)
2.40	91.14	8.86	4 gals. 4¾ pts.	3¼	91 gals. 6¼ pts	8 gals. 1¾ pts.	2.19	10.64	16 55
3.50	90.98	9.02	4 gals. 4¾ pts.	3¼	91 gals. 5¼ pts	8 gals. 2¾ pts.	3.18	10.41	16 44
4	90.90	9.10	4 gals. 4¾ pts.	3¼	91 gals. 4¾ pts.	8 gals. 3¼ pts.	3 64	10.30	16 35
5	90.75	9.25	4 gals. 4½ pts.	3½	91 gals. 3¾ pts.	8 gals. 4¼ pts.	4.54	10.09	16 23
6	90.60	9.40	4 gals. 4½ pts.	3½	91 gals. 2¾ pts.	8 gals. 5¼ pts.	5 44	9.88	16.10
7	90.45	9.55	4 gals. 4½ pts.	3½	91 gals. 1¾ pts.	8 gals. 6¼ pts.	6.33	9.67	15 98
8	90.30	9.70	4 gals. 4½ pts.	3½	91 gals. 1 pt.	8 gals. 7 pts.	7.22	9.46	15 86
9	90.15	9.85	4 gals. 4½ pts.	3½	91 gals.	9 gals.	8.11	9.26	15 74
10	90	10	4 gals. 4¼ pts.	3¾	90 gals. 7 pts.	9 gals. 1 pt.	9	9.05	15.62
11	89.85	10.15	4 gals. 4¼ pts.	3¾	90 gals. 6 pts.	9¼ gals.	9.88	8.84	15.50
12	89.70	10.30	4 gals. 4¼ pts.	3¾	90 gals. 5 pts.	9 gals. 3 pts.	10.76	8.65	15 38
13	89.55	10.45	4 gals. 4¼ pts.	3¾	90 gals. 4½ pts.	9 gals. 3¾ pts.	11.64	8.44	15.27
14	89.40	10.60	4 gals. 4¼ pts.	3¾	90 gals. 3½ pts.	9 gals. 4¾ pts.	12.52	8.23	15.14
15	89.25	10.75	4 gals. 4¼ pts.	3¾	90 gals. 2½ pts.	9 gals. 5¾ pts	13.39	8.02	15.02
16	89.10	10.90	4½ gals.	4	90 gals. 1¼ pts.	9 gals. 6¾ pts.	14.26	7.82	14.91
17	88.95	11.05	4½ gals.	4	90 gals. ½ pt.	9 gals. 7½ pts.	15.12	7.62	14 79
18	88.80	11.20	4½ gals.	4	89 gals. 7½ pts.	10 gals. ½ pt.	15.98	7.42	14.67
19	88.65	11.35	4½ gals.	4	89 gals. 6½ pts	10 gals. 1½ pts.	16 84	7.22	14.56
20	88.50	11.50	4½ gals.	4	89 gals. 5¾ pts.	10 gals. 2¼ pts.	17.70	7 02	14.44

ADAPTING FRESH FRUITS AND FRUITS PACKED IN VARIOUS WAYS TO USE IN ACCORDANCE WITH FOREGOING TABLES

The preceding tables (pages 270 to 279), give figures for cold-packed fruit "2 to 1" (two pounds of fruit to one pound sugar). Using those tables as a basis, the proportions of fruit packed in any other way or of fresh fruit can be readily determined in the following manner:

Mix fruit and sugar in proportions stated in the following table. The mixture may then be used instead of cold-pack (2 to 1) fruit without materially varying the formula.

FRUITS	Quantity of granulated sugar to be added to each pound of fruit[1]	Quantity of granulated sugar to be added to each gallon of fruit[1]	Quantity of granulated sugar to be added to each No. 10 can of fruit[1]
Cold pack, 3 lbs. of fruit to 1 of sugar	2 oz.	1 lb. 1½ oz.	14¾ oz.
Cold pack, 4 to 1	3½ oz.	1 lb. 14¾ oz.	1 lb. 9¾ oz.
Cold pack, no sugar	½ lb.	4 lbs. 6½ oz.	3 lbs. 10¾ oz.
Cold pack, in water[2]	½ lb.	4 lbs. 6½ oz.	3 lbs. 10¾ oz.
Kettle packed, 10% concentration, no sugar[3]	8¾ oz.	4¾ lbs.	4 lbs. 1¼ oz.
Canned, 10% sirup[4]	7¾ oz.	4 lbs. 4¼ oz.	3 lbs. 9 oz.
Canned, 15% sirup[4]	6¾ oz.	3¾ lbs.	3 lbs. 2 oz.
Canned, 20% sirup[4]	6½ oz.	3 lbs. 10 oz.	3 lbs. ½ oz.
Canned, 25% sirup[4]	6 oz.	3 lbs. 4¾ oz.	2 lbs. 13 oz.
Canned, 30% sirup[4]	5¾ oz.	3 lbs. 1¼ oz.	2 lbs. 9¼ oz.
Canned, 35% sirup[4]	5¼ oz.	2 lbs. 13¾ oz.	2 lbs. 6¼ oz.
Canned, 40% sirup[4]	4¾ oz.	2 lbs. 10¼ oz.	2 lbs. 3½ oz.
Canned, 45% sirup[4]	4½ oz.	2 lbs. 6¾ oz.	2 lbs. ½ oz.
Canned, 50% sirup[4]	4 oz.	2 lbs. 3¼ oz.	1 lb. 13½ oz.
Canned, 55% sirup[4]	3½ oz.	1 lb. 15¾ oz.	1 lb. 10½ oz.
Canned, 60% sirup[4]	3¼ oz.	1 lb. 12¼ oz.	1 lb. 7¾ oz.
Canned, 80% sirup[4]	1¾ oz.	14 oz.	11¾ oz.
Fresh Fruit[5]	½ lb.	4 lbs. 6½ oz.	3 lbs. 10¾ oz.

[1]Fruit varies in weight. These quantities are averages and are accurate enough for practical use.

[2]The weight of the fruit will include the water in which it is packed. Much flavoring and juice is in the water: if deemed desirable, it may be poured off and used with a corresponding reduction of flavoring material in making fruit ices or water ices according to the formulas on pages 345 to 366. The sugar should then be added, in the proportions stated above, to the drained fruit that remains.

[3]Due allowance has been made for the concentration in figuring increased sugar additions.

[4]Sirup requirements differ slightly: the average has been taken.

[5]Fresh fruit, when sugar is added by measure, must be crushed. It is always better to weigh fresh fruit: add sugar to it by weight and then add the combined fruit and sugar to the mix by weight. Calculate 8.8 lbs. fresh fruit as a gallon, and 10 lbs. of fresh fruit and sugar mixed together, as one gallon.

APPLE ICE-CREAM

Make a regular fruit mix of the desired standard, without the fruit, in accordance with one of the tables numbered I (for strawberries, etc.) on pages 270 to 278, omitting the vanilla flavoring.

Flavor the mix about one-half desired strength with Imitation Apple Flavoring. Color to desired shade with a combination of 1 part (by volume) of Creme de Menthe Shade liquid or dry color to 20 parts of Navel Orange Shade dry color.

Take:
For 100-lb. mix, 1.322 lbs. or 1¼ pts. lemon juice,
for 5-gal. mix, 3 lemons or ½ pt. lemon juice,
For 100-gal. mix, 60 lemons or 1 gal. 3 pts. lemon juice.
Peel lemons, removing seeds and all the white inner skin, and squeeze out juice and pulp.

Take of tart apples the quantity named in the following table for the standard selected:

	QUANTITY OF TART APPLES					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	23.304	23.704	24.237	24.904	25.704	26.504
For 5-gal. mix (pounds)	10½	10¾	11	11¼	11½	12
For 100-gal. mix (pounds)	212½	215¾	220	225	231¼	237¼

Pare, core and grate apples. Do this just before adding to mix, as otherwise they will darken and spoil its color.

Put the mix into the freezer. When it is about half frozen, while dasher revolves, add, first, the lemon juice and pulp and then the grated apple pulp.

Complete the freezing: harden and pack in usual way.

BAKED APPLE ICE-CREAM

Make a regular fruit mix of the desired standard, without the fruit, in accordance with one of the tables numbered I (for strawberries, etc.) on pages 270 to 278, omitting the vanilla flavoring.

Flavor the mix to about one-half desired strength with Imitation Apple Flavoring. Color to desired shade with a combination of 1 part (by volume) of Creme de Menthe Shade liquid or dry color to 20 parts of Navel Orange Shade dry color.

Take of tart apples the quantity named in the following table for the standard selected:

	QUANTITY OF TART APPLES					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	26.86	27.43	27.72	28.59	29.43	30.29
For 5-gal. mix (pounds)	12¼	12½	12½	13	13¼	13½
For 100-gal. mix (pounds)	245	249¾	251¾	258¾	264¾	271¼

Core the apples and place a little granulated sugar and ground cinnamon in the hole thus made. Put into baking pan with a very little water, and bake until they are soft. Cool and press through sieve.

When mix is nearly frozen, while dasher revolves, slowly add apple pulp through fruit funnel.

Complete the freezing; harden and pack in usual way.

BANANA ICE-CREAM

Make a fruit mix of the standard desired, without fruit, in accordance with the tables numbered III (for pineapple, plums, etc.) on pages 270 to 279, omitting vanilla flavoring.

Flavor the mix to about half the desired strength with Banana flavoring or emulsion.

Color to suit with Banana Shade Yellow liquid or dry color.

Peel the number of ripe yellow bananas required to yield the quantity of pulp shown for the standard chosen in the following table:

	QUANTITY OF BANANA PULP					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	14.10	14.33	14.55	15	15.45	15.90
For 5-gal. mix (pounds)	6½	6½	6¾	6¾	7	7¼
For 100-gal. mix (pounds)	128¾	130½	134	135½	139	142½

About 4 dozen large bananas will provide 15 pounds of pulp, the quantity required for the 10 per cent. 100-pound mix. Bananas vary so in size that it is better to add them to the mix by weight, as shown in above table.

Squeeze banana pulp through sieve and, when mix is nearly frozen, while dasher revolves, slowly add to mix through fruit funnel. Complete the freezing: harden and pack in usual way.

DATE MARMALADE ICE-CREAM

Make a fruit mix of the standard desired in accordance with the tables for pineapple and plum Ice-Cream on pages 270 to 279, omitting the fruit.

Take of dates, from which the pits and stems have been removed, the quantity specified for the chosen standard in the same table.

Steam the dates until they are soft. Then mash and strain through a sieve. Sprinkle a little True Lemon Flavoring extract over them, and add them to the mix when it is partly frozen.

The mix should be colored with Caramel Shade Brown dry color.

If a regular steaming kettle is not available, the dates may be placed in a wire strainer or a colander and suspended by a wire over water in a kettle, or the strainer or colander may be placed on an inverted cup above water in a kettle, and thus steamed.

GRAPE ICE-CREAM

Make a regular fruit mix of the desired standard, without the fruit, in accordance with one of the tables numbered IV (for cherries, etc.) on pages 270 to 279, omitting the vanilla flavoring.

Take of grape juice the quantity specified for fruit in the same table for the standard selected.

Flavor the mix to about half desired strength with Imitation Grape Flavoring or emulsion.

Color to suit according to color of grape juice used: with Cherry Blossom Shade Pink liquid or dry color for red juice, Pansy Shade Violet dry color for purple juice, and a combination of 20 parts (by volume) of Lemon Shade Yellow and 1 part Creme de Menthe Shade Green liquid or dry color for green, or white, grape juice.

Put mix into freezer. When mix is nearly frozen, while dasher revolves, slowly add the grape juice through fruit funnel.

Complete the freezing: harden and pack in usual way.

LEMON ICE CREAM

Make a regular fruit mix of the standard desired, without the fruit, in accordance with one of the tables numbered I (for strawberries, etc.) on pages 270 to 278.

Flavor mix to about one-half desired strength with True Lemon flavoring extract or emulsion, and color to suit with Lemon Shade Yellow liquid or dry color.

When mix is nearly frozen add to it the quantity of cold-pack lemon juice (packed 5 pounds of sugar to 1 gallon of lemon juice) shown in the same table, for the standard selected.

Complete the freezing: harden and pack in usual way.

The juice of fresh ripe lemons may be used instead of the cold-pack juice. In that case take the number of lemons of good size shown, for the standard of the Ice-Cream to be made, in the following table:

	NUMBER OF LEMONS					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix	60	61	62	64	66	68
For 5-gal. mix	27	28	28	29	30	31
For 100-gal. mix	547	555	563	578	594	609

Remove skin and seeds from lemons, and press out pulp and juice. Add to it the quantity of sugar shown, for the standard selected, in the following table:

	QUANTITY OF GRANULATED SUGAR					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	6.86	6.97	7.08	7.30	7.52	7.74
For 5-gal. mix (pounds)	3	3¼	3¼	3¼	3½	3½
For 100-gal. mix (pounds)	62½	63½	64¼	66	67¾	69¼

Freeze mix in usual way, adding mixture of lemon juice and sugar when it is nearly frozen.

ORANGE ICE-CREAM, NO. 1

Make a regular vanilla mix of the desired standard:

For 100-lb. mix.....95 lbs.
For 5-gal. mix .....4 gals. ¼ pt.
For 100-gal. mix .....95 gals. 1¾ pts.

Flavor to about one-half desired strength with True Orange extract or emulsion, and color to suit with Navel Orange Shade liquid or dry color.

Add to it, when partly frozen, concentrated orange juice (6 to 1 concentration):

To 100-lb. mix .....5 lbs.
To 5-gal. mix .....1¾ pts.
To 100-gal. mix .....4 gals. 6¼ pts.

To this fruit juice, before putting it into the mix, add citric acid solution (made according to formula on page 368) as follows:

For 100-lb. mix .....10½ fl. oz.
For 5-gal. mix .....5 fl. oz.
For 100-gal. mix.....6 pts.

Complete the freezing: harden and pack in usual way.

Where Ice-Cream is required to be of a certain standard with no reduction in milk fat for added fruit juice, instead of the quantities of mix and orange juice stated above, use the quantity of regular vanilla mix of required standard and the quantity of concentrated orange juice and 30 per cent. cream shown for the standard selected in the following table:

	Standard of mix and of Ice-Cream				
	7% Milk-fat or Butter-fat	8% Milk-fat or Butter-fat	10% Milk-fat or Butter-fat	12% Milk-fat or Butter-fat	14% Milk-fat or Butter-fat
For 100-lb. mix:					
Mix	93.47 lbs.	93.18 lbs.	92.50 lbs.	91.36 lbs.	90.62 lbs.
Orange juice	5 lbs.	5 lbs.	5 lbs.	5 lbs.	5 lbs.
Cream, 30%	1.53 lbs.	1.82 lbs.	2.50 lbs.	3.34 lbs.	4.38 lbs.
For 5-gal. mix:					
Mix	4 gals. 5¾ pts.	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4½ pts.
Orange juice	1½ pts.	1½ pts.	1½ pts.	1½ pts.	1½ pts.
Cream, 30%	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix:					
Mix	94¼ gals.	93 gals. 7½ pts.	93¼ gals.	92 gals. 2½ pts.	91 gals. 2¼ pts.
Orange juice	4 gals. ½ pt.	4 gals. ½ pt.	4 gals. ¼ pt.	4 gals. ¼ pt.	4 gals.
Cream, 30%	1 gal. 5½ pts.	2 gals.	2 gals. 5¾ pts.	3 gals. 5¼ pts.	4 gals. 5¾ pts.

Add cream to mix before beginning to freeze. In all other respects proceed as above directed.

ORANGE ICE-CREAM, NO. 2

Make a regular fruit mix of the standard desired, without the fruit, in accordance with one of the tables numbered I (for strawberries, etc.) on pages 270 to 278.

Flavor the mix to about one-half desired strength with True Orange flavoring extract or emulsion, and color to suit with Navel Orange Shade liquid or dry color.

Take the quantity of cold-pack orange juice (packed 5 pounds of sugar to 1 gallon of juice) shown in the same table for the standard selected, stir into it citric acid solution (made according to formula on page 368) as follows:

For 100-lb. mix.....10½ fl. oz.
For 5-gal. mix .....5 fl. oz.
For 100-gal. mix .....6 pts.

Add orange juice to mix when it is nearly frozen. Freeze, harden and pack in usual way.

The juice of fresh ripe oranges may be used instead of the cold-pack juice.

In that case, take the number of oranges shown for the standard of the Ice-Cream to be made, in the following table:

	NUMBER OF ORANGES					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix	41	41	42	43	45	46
For 5-gal. mix	19	19	19	20	20	21
For 100-gal. mix	370	374	379	389	399	412

Peel the oranges, carefully removing all the white inner skin and the seeds and afterwards pressing out the juice and pulp. To this add the quantity of granulated sugar, shown for the standard selected in the following table:

	QUANTITY OF GRANULATED SUGAR					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	6.86	6.97	7.08	7.30	7.52	7.74
For 5-gal. mix (pounds)	3	3¼	3¼	3¼	3½	3½
For 100-gal. mix (pounds)	62½	63½	64¼	66	67¾	69¼

When sugar is dissolved add citric acid solution. Freeze in usual way, adding the orange juice when mix is nearly frozen.

PEACH ICE-CREAM

(Using Seeds with Pulp for Special Flavor)

Make a peach Ice-Cream mix of desired standard in accordance with the tables on pages 270 to 278.

Take:

For 100-pound mix..... 30 peach kernels,
For 5-gallon mix..... 12 peach kernels,
For 100-gallon mix.....240 peach kernels.

Grind the peach kernels very fine. Boil in enough water fully to cover them for five minutes. Press through a sieve and add them to mix.

Flavor the mix to taste with Imitation Peach Flavoring or emulsion, and color to suit with Navel Orange Shade color.

Freeze, harden, pack, etc. in usual way.

PRUNELLE ICE-CREAM

Make a fruit mix of the desired standard (without the fruit) in accordance with one of the tables numbered IV (for Cherries, etc.) in the series of tables on pages 270 to 279, omitting the vanilla flavoring.

Color the mix lightly with Caramel Shade Brown dry color.

Take of lemons (or lemon juice), granulated sugar and water the following quantities:

For 100-lb. mix.....
- 1.322 lbs. or 1¼ pts. lemon juice,
- 1.108 lbs. granulated sugar,
- 1.152 lbs. water;

For 5-gal. mix.....
- 6 lemons or 1 pt. lemon juice,
- ½ lb. granulated sugar,
- ½ pt. water;

For 100-gal. mix.....
- 120 lemons or 1 gal. 3 pts. lemon juice,
- 10 lbs. granulated sugar,
- 1¼ gals. water.

Peel and seed lemons, removing all the white inner skin and squeeze out juice and pulp.

Take of dried prunelles the quantity named for the chosen standard in the following table:

	QUANTITY OF PRUNELLES					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	5.818	5.968	6.118	6.418	6.718	7.018
For 5-gal. mix (pounds)	2½	2¾	2¾	3	3	3¼
For 100-gal. mix (pounds)	53	54¼	55½	58	60½	62¾

Put lemon juice and pulp, sugar, water and prunelles into a cooking vessel, and stew until the prunelles are soft (about 20 minutes). The flavor is better when the prunelles are cooked slowly without boiling.

Put mix into freezer and when it is nearly frozen, while dasher revolves, add stewed fruit through fruit funnel.

Complete the freezing, harden and pack in usual way.

In some states the milk fat displaced by the added sugar and water must be restored while that displaced by the fruit need not be.

Therefore, in such states, instead of using the fruit mix as directed above, combine the regular 8 per cent. vanilla mix, without the vanilla flavoring, in the following proportions:

For 100-lb. mix..... { Regular 8% vanilla mix..89.27 lbs
Cream, 30% ..... 1.03 lbs.;

For 5-gal. mix..... { Regular 8% vanilla mix.. 4 gals. 3¾ pts.;
Cream, 30% .....½ pt.;

For 100-gal. mix..... { Regular 8% vanilla mix..89 gals. 2¼ pts.
Cream, 30% .....1 gal. 1 pt.

In all other respects proceed as above directed.

PRUNE ICE-CREAM

Make a fruit mix of the standard desired, without the fruit, in accordance with one of the tables numbered IV (for Cherries, etc.) in the series of tables on pages 270 to 279, omitting the vanilla flavoring.

Color to suit with Chocolate Shade Dark Brown dry color.

Flavor, not too strongly, with Imitation Plum flavoring.

Take of lemons or lemon juice, granulated sugar and water, the following quantities:

For 100-lb. mix..... { 1.322 lbs. or 1¼ pts. lemon juice,
1.108 lbs. granulated sugar,
1.152 lbs. water;

For 5-gal. mix..... { 6 lemons or 1 pt. lemon juice,
½ lb. granulated sugar,
½ pt. water;

For 100-gal. mix..... { 120 lemons or 1 gal. 3 pts. lemon juice,
10 lbs. granulated sugar,
1¼ gals. water.

Peel and seed the lemons, removing all the white inner skin and squeeze out the juice and pulp.

Take of dried unpitted prunes the quantity named in the following table for the standard selected:

	QUANTITY OF PRUNES					
	For 6% standard	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	7.272	7.46	7.648	8.023	8.395	8.773
For 5-gal. mix (pounds)	3¼	3½	3½	3¾	3¾	4
For 100-gal. mix (pounds)	66¼	68	69½	72½	65½	78½

Put lemon juice, sugar, water and prunes in a cooking vessel and stew gently, without boiling, until the prunes are soft (about 20 minutes).

Strain through sieve or cloth, and cool. The prunes have a better flavor when stewed with the pits in.

Put mix in freezer. When nearly frozen add stewed prunes. Complete the freezing, harden and pack in usual way.

In some states the milk fat displaced by the added sugar and water must be restored, while that displaced by the fruit need not be.

Therefore, in such states instead of using the fruit mix as directed above, combine the regular 8 per cent. vanilla mix, without the vanilla flavoring, in the following proportions:

For 100-lb. mix..... { Regular 8% vanilla mix..89.27 lbs.,
Cream, 30% ..... 1.03 lbs.;

For 5-gal. mix..... { Regular 8% vanilla mix.. 4 gals. 3¾ pts.,
Cream, 30% .....½ pt.;

For 100-gal. mix..... { Regular 8% vanilla mix..89 gals. 2¼ pts.
Cream, 30% .....1 gal. 1 pt.

In all other respects proceed as above directed.

ORANGE MARMALADE ICE-CREAM

Make a fruit mix (omitting the fruit) of the standard desired in accordance with one of the tables numbered IV (for Cherries, etc.) in the series of tables on pages 270 to 279.

Flavor the mix to taste with True Orange flavoring extract or emulsion, and add a little True Lemon extract or emulsion. Color with Navel Orange shade liquid or dry color.

Take of orange marmalade the quantity named for fruit in the table.

Put mix in freezer. When it is nearly frozen, while dasher revolves, slowly add fruit.

GRAPEFRUIT MARMALADE ICE-CREAM

Make in the same manner as Orange Marmalade Ice-Cream (see formula above) omitting the True Orange flavoring extract or emulsion, and using grapefruit marmalade instead of orange marmalade.

NUT ICE-CREAM

(Standard or Regular Mix)

DIRECTIONS FOR MAKING

The nuts for which the nut tables are calculated are shelled, blanched (where blanching is necessary) and chopped—not ground, except where so specified.

They differ slightly, both in weight and in total solids contents; but the difference is not sufficient to alter the quantities perceptibly in ordinary production. The figures used, in the tabulated formulas on the following pages, are for good, cured "English" (Persian) and black walnuts. Other nuts are slightly lower in total solids. If, for any reason, absolute accuracy is required in the use of other nuts, then lower the total solids to the extent shown in the table below. For each pound of nut meats in the 100-pound mix, deduct the fraction shown opposite the species of nut to be used, as follows:

Deduction from the Total Solids, per Pound of Nuts, If Other than Walnuts are to be Used.

For—		For—		For—	
Almonds, deduct	0.023;	Chestnuts	0.034;	Marrons	0.034;
Beechnuts	0.015;	Filberts	0.012;	Peanuts	0.067;
Brazil nuts	0.028;	Hazelnuts	0.012;	Pecans	0.005;
Butternuts	0.009;	Hickory nuts	0.012;	Pistachios	0.017.

However, no harm will result if those differences are ignored and all nuts calculated alike, as given in the table.

Blanch the nuts which have an objectionable inner skin (pellicle), as have almonds, hazelnuts, peanuts, pistachios, and Brazil nuts, in the manner described on page 94.

Chop or break the shelled and perhaps blanched nut meats into coarse pieces. Grinding brings out the flavor better, but the eye demands pieces of good size and fancy Ice-Creams may have even unbroken half kernels.

The quantity of nuts used in the formulas is lower in the low standards than in the high. Owing to the high nutritive value of nuts, this would logically be reversed if the object were solely to offset the lack of fat in the first. However, nuts are used to please the eye and to give added zest to the Ice-Cream. They are expensive and must be used more sparingly in the lower standards. The lower standards would not bring an adequate price to cover a greater proportion of nuts. The higher standards are more often made for those who can pay the price and demand an appearance of greater value.

Nut-fat is not milk-fat or butter-fat and cannot be calculated as such in standardizing an Ice-Cream.

Flavor the nut mix to taste: for walnuts, with Imitation Walnut flavoring; for almonds, with True Bitter Almond flavoring extract or emulsion; for pistachio nuts, with Imitation Pistachio flavoring or emulsion. For all other nuts, the vanilla flavoring in the mix will suffice, unless some other nut is used to replace walnut, almond or pistachio. In that case, use the flavor of the nut which is displaced. Thus if pecans are used instead of walnuts, Imitation Walnut flavoring can be used: if almonds or beechnuts are used instead of pistachio, Imitation Pistachio flavoring, or emulsion can be used.

The vanilla flavoring in the regular vanilla mix makes a very fine foundation for the flavor of Nut Ice-Cream. Used alone, it brings out or accentuates the flavor of the nuts when a piece of nut kernel is bitten into—a very pleasing experience. However, a delightful novelty is provided by adding a mere trace of one of the nut flavors, either with or without vanilla. If the Nut Ice-Cream is as strongly flavored as the nut itself, the pleasurable experience of biting into a nut of good quality is lost. Use our flavoring extracts, flavors and emulsions, they are strong and economical to use. Better distribution is obtained if they are dissolved in a small part of the mix and then stirred into the batch.

To color Nut Ice-Cream, except pistachio and where otherwise recommended, use Yellow Liquid Color for Ice-Cream, which produces a pleasing creamy white. Yolk-Em Egg Shade is suitable in New York, Neapolitan and similar Ice-Creams or frozen puddings.

Be careful to select from the following tables (pages 293 to 295) that method of compounding the nut mix that will produce an Ice-Cream equal to the statutory standard (if there is one) in your state, and equal to federal requirements (of 12 per cent. milk fat for a nut mix) if the Ice-Cream is to be used in interstate commerce.

The tables provide the basic Nut Ice-Cream mix, to which any species of nut may be added in the manner indicated.

With Milk Fat Reduced

Assume, for example, that your state has adopted a standard, which requires a 14 per cent, vanilla or plain Ice-Cream and permits 12 per cent. if nuts are added.

In that case, select one of the two formulas, on page 293, for "12% milk fat, reduced from 14%". Water should be used only where milk is not available: therefore the last formula is selected as preferable.

For a 100-gallon mix, take 86 gallons ¼ pint of regular 14 per cent. vanilla mix, add to it 4 gallons 1½ pints of skim milk, 4 gallons 6½ pints condensed skim milk (3 to 1 concentration), and 9¾ pounds granulated sugar. Assuming that Walnut Ice-Cream is desired, flavor

very sparingly with Walnut flavoring, and color with Yellow Liquid Color for Ice-Cream.

Stir sufficiently to dissolve the sugar and put the mix or a batch of it into the freezer. When it is nearly frozen, while the dasher revolves, add the broken "English" or black walnut meats through the fruit funnel. Then complete the freezing and draw as for the regular vanilla mix.

With Milk-Fat Restored

Where state law fixes a standard for Ice-Cream, and does not provide for a reduction of milk fat on account of the addition of nuts, use in like manner, the tables on page 294.

Without Restoring Lowered Milk Solids

In states which have no legal Ice-Cream standard and in those states which permit such reduction of milk fat as is caused by the added nuts, add the nuts to the regular vanilla mix in the proportions given in the tables on page 295, and add the flavor and color in the manner provided above.

NUT ICE-CREAM

Using the Regular Vanilla Mix with Milk Fat Reduced[1]

6% Milk Fat, reduced from 8%—Standard for Ark., Conn., N. J., Pa., Tex.,
8% Milk Fat, reduced from 10%—Standard for Cal., Ky., La., Md., Ore.
9% Milk Fat, reduced from 10%— Standard for Mont.
10% Milk Fat, reduced from 12%—Standard for Iowa, Mich.. Minn., N. Dak., Wis.
12% Milk Fat, reduced from 14%—Standard for Alaska, Canal Zone, Fla., Guam, Hawii. Idaho, Me., Neb., Nev., Okla., Phil. Is., Pto. Rico., S. Dak., Utah, Vt., and under federal (U. S.) regulations.

Standard of regular vanilla mix (per cent. milk fat)	Standard of reduced nut mix (per cent. milk fat)	Ingredients to be combined to make nut mix	Quantity for 100-pound mix (pounds)	Quantity for 5-gallon mix	Quantity for 100-gallon mix	Total solids in nut mix (per cent.)	Calculated weight per gallon of nut mix at 68° F. (pounds)	Calculated weight per gallon of frozen Nut Ice-Cream (pounds)
8	6	Regular 8% vanilla mix	74.95	3¾ gals.	75 gals. 3 pts.	33.86	9.131	4.891
		Nut meats	2.33	1 lb. 1 oz.	21 lbs. 5 oz.			
		Powdered skim milk	3.19	1 lb. 7½ oz.	29 lbs. 2 oz.			
		Granulated sugar	3.86	1¾ lbs.	35¼ lbs.			
		Water	15.67	7 pts.	17 gals. 1½ pts.			
8	6	Regular 8% vanilla mix	74.81	3¾ gals.	75 gals. 1¼ pts.	33.86	9.122	4.887
		Nut meats	2.33	1 lb. 1 oz.	21¼ lbs.			
		Skim milk	11.85	5 pts.	12 gals. 4½ pts.			
		Cond. skim milk (3 to 1)	7.14	3 pts.	7 gals.			
		Granulated sugar	3.87	1 lb. 12¼ oz.	35 lbs. 5 oz.			
10	8	Regular 10% vanilla mix	79.98	4 gals. ¼ pt.	80 gals. 3¼ pts.	35.37	9.075	4.775
		Nut meats	2.61	1 lb. 3 oz.	23 lbs. 11 oz.			
		Powdered skim milk	2.54	1 lb. 3½ oz.	23 lbs. 1 oz.			
		Granulated sugar	3.08	1 lb. 6½ oz.	27 lbs. 15 oz.			
		Water	11.79	5¼ pts.	12 gals. 7 pts.			
10	8	Regular 10% vanilla mix	79.90	4 gals. ¼ pt.	80¼ gals.	35.37	9.066	4.772
		Nut meats	2.61	1 lb. 3 oz.	23 lbs. 11 oz.			
		Skim milk	8.40	3½ pts.	8 gals. 6¾ pts.			
		Cond. skim milk (3 to 1)	6	2½ pts.	5 gals. 7 pts.			
		Granulated sugar	3.09	1 lb. 6½ oz.	28 lbs.			
10	9	Regular 10% vanilla mix	89.95	4½ gals.	90 gals. 1¼ pts.	36.17	9.056	4.725
		Nut meats	2.75	1¼ lbs.	24 lbs. 14 oz.			
		Skim milk	2.02	1 pt.	2 gals. 1 pt.			
		Cond. skim milk (3 to 1)	3.74	1½ pts.	3 gals. 5¼ pts.			
		Granulated sugar	1.54	11 oz.	13½ lbs.			
12	10	Regular 12% vanilla mix	83.25	4 gals. 1½ pts.	83 gals. 5¼ pts.	36.87	9.037	4.674
		Nut meats	2.89	1 lb. 5 oz.	26 lbs. 2 oz.			
		Skim milk	5.83	2½ pts.	6 gals. 1 pt.			
		Cond. skim milk (3 to 1)	5.44	2¼ pts.	5 gals. 2½ pts.			
		Granulated sugar	2.59	1 lb. 2¾ oz.	23 lbs. 7 oz.			
14	12	Regular 14% vanilla mix	85.71	4 gals. 2½ pts.	86 gals. 1¼ pts.	38.38	8.998	4.575
		Nut meats	3 17	1 lb. 7 oz.	28 lbs. 9 oz.			
		Powdered skim milk	1.82	13 oz.	16 lbs. 6 oz.			
		Granulated sugar	2.20	1 lb.	19 lbs. 13 oz.			
		Water	7.10	3 pts.	7 gals. 5½ pts.			
14	12	Regular 14% vanilla mix	85.66	4 gals. 2½ pts.	86 gals. ¼ pt.	38.38	8.993	4.573
		Nut meats	3.17	1 lb. 7 oz.	28½ lbs.			
		Skim milk	4.02	1½ pts.	4 gals. 1½ pts.			
		Cond. skim milk (3 to 1)	4.95	2 pts.	4 gals. 6½ pts.			
		Granulated sugar	2.20	1 lb.	9¾ lbs.			

[1]The milk-solids-not-fat, sugar solids, swell, and yield per gallon of the nut mix will be those for the standard vanilla mix shown in the table on page 17.

NUT ICE-CREAM

Using the Regular Vanilla Mix With Milk-Fat Restored

7% Milk Fat—Standard for Mass.

8% Milk Fat—Standard for D. C., Ga., Ill., Ind., Miss., Mo., N. C., N. Y., O., R. I., Va., Wash.

10% Milk Fat—Standard for Ariz., Colo., Kan., Wyo.

14% Milk Fat—Standard for N. H.

Standard of Nut Ice-Cream (per cent. milk fat)	Ingredients	Quantity for 100-pound mix (pounds)	Quantity for 5 gallon mix	Quantity for 100-gallon mix	Milk solids not fat (per cent.)[1]	Calculated weight per gallon of nut mix at 68° F. (pounds)	Calculated weight per gallon of frozen Nut Ice-Cream (pounds)
7	Regular 7% vanilla mix	94.73	4¾ gals.	94 gals. 4½ pts.	10.29	9.085	4.955
	Nut meat	2.47	1 lb. 2 oz.	22 lbs. 7 oz.			
	Cream, 18 per cent	2.05	1 pt.	2 gals. 1¾ pts.			
	Granulated sugar	0.75	5½ oz.	6 lbs. 13 oz.			
7	Regular 7% vanilla mix	96.80	4 gals.6¾ pts.	96 gals. 5¼ pts.	10.35	9.087	4.957
	Nut meats	2.47	1 lb. 2 oz.	22 lbs. 8 oz.			
	Unsalted butter	0.27	2¼ oz.	2 lbs. 9 oz.			
	Granulated sugar	0.46	3½ oz.	4 lbs. 3 oz.			
8	Regular 8% vanilla mix	95.59	4 gals.6¼ pts.	95 gals. 3½ pts.	10.11	9.064	4.770
	Nut meats	2.61	1 lb. 3 oz.	23 lbs. 11 oz.			
	Cream, 30 per cent.	1.18	¾ pt.	1 gal. 2¼ pts.			
	Granulated sugar	0.62	5 oz.	5 lbs. 10 oz.			
8	Regular 8% vanilla mix	96.58	4 gals.6¾ pts.	96 gals. 3½ pts.	10.13	9.065	4.771
	Nut meats	2.61	1 lb. 3 oz.	23 lbs. 11 oz.			
	Unsalted butter	0.33	2½ oz.	3 lbs.			
	Granulated sugar	0.48	3½ oz.	4 lbs. 7 oz.			
10[2]	Regular 10% vanilla mix	94.54	4 gals.5¾ pts.	94 gals. 3 pts.	9.65	9.019	4.665
	Nut meats	2.89	1 lb. 5 oz.	26 lbs. 1 oz.			
	Cream, 30 per cent	1.82	1 pt.	2 gals.			
	Granulated sugar	0.75	5½ oz.	6¾ lbs.			
10	Regular 10% vanilla mix	96.10	4 gals.6½ pts.	95 gals. 7½ pts.	9.67	9.02	4.666
	Nut meats	2.89	1 lb. 5 oz.	26 lbs. 1 oz.			
	Unsalted butter	0.47	3½ oz.	4¼ lbs.			
	Granulated sugar.	0.54	6¾ oz.	8½ lbs.			
14	Regular 14% vanilla mix	91.43	4 gals.4½ pts.	91 gals. 1¼ pts.	8.72	8.925	4.463
	Nut meats	3.45	1 lb. 9 oz.	30 lbs. 10 oz.			
	Cream, 30 per cent	4.00	2¼ pts.	4 gals. 3 pts.			
	Granulated sugar	1.12	½ lb.	10 lbs.			
14	Regular 14% vanilla mix	95.08	4¾ gals.	94 gals. 7¼ pts.	8.77	8.935	4.468
	Nut meats	3.45	1 lb. 9 oz.	30 lbs. 12 oz.			
	Unsalted butter	0.83	6 oz.	7 lbs. 7 oz.			
	Granulated sugar	0.64	5 oz.	5¾ lbs.			

[1]The reduction of milk-solids-not-fat, being less than 0.60 per cent., is deemed too small to make it necessary to restore them with another ingredient.

[2]In Kansas draw when swell is at 89.87 per cent.

NUT ICE-CREAM

Using the Regular Vanilla Mix Without Restoring Lowered Milk Solids

The Standard of the resulting Nut Ice-Cream must be kept in mind to avoid possible violations of law.

Standard of regular Vanilla Ice-Cream mix (per cent milk fat)	100-lbs. mix		5 gal. mix		100 gal. mix		Standard of resulting Nut Ice-Cream mix		
	Quantity regular vanilla mix (pounds)	Quantity nut meats (pounds)	Quantity regular vanilla mix	Quantity nut meats	Quantity regular vanilla mix	Quantity nut meats	Milk fat (per cent)	Milk solids not fat (per cent.)	Total solids (per cent.)
2.40	98.17	1.83	4 gals.7¼ pts.	13½ oz.	97 gals. 7¾ pts.	16 lbs. 13 oz.	2.36	11.46	30.88
3.50	98.02	1.98	4 gals. 7 pts.	14½ oz.	97 gals. 6½ pts.	18 lbs. 2 oz.	3.42	11.19	31.63
4	97 95	2.05	4 gals. 7 pts.	15 oz.	97¾ gals.	18¾ lbs.	3.92	11.10	31.95
5	97 81	2.19	4 gals. 7 pts.	1 lb.	97 gals. 4¾ pts.	20 lbs.	4.89	10.88	32.61
6	97.67	2.33	4 gals. 7 pts.	1 lb. 1 oz.	97 gals. 3½ pts.	21¼ lbs.	5.86	10.66	33.29
7	97.53	2.47	4 gals. 7 pts.	1 lb. 2 oz.	97 gals. 2¼ pts.	22 lbs. 7 oz.	6.83	10.43	33.97
8	97.39	2.61	4 gals. 7 pts.	1 lb. 3 oz.	97 gals. 1 pt.	23 lbs. 11 oz.	7.79	10.21	34.63
9	97.25	2.75	4 gals.6¾ pts.	1¼ lbs.	97 gals.	24 lbs. 14 oz.	8.75	9.99	35.31
10	97.11	2.89	4 gals.6¾ pts.	1 lb. 5 oz.	96 gals. 7 pts.	26 lbs. 1 oz.	9.71	9.77	35.99
11	96.97	3.03	4 gals.6¾ pts.	1 lb. 6 oz.	96 gals. 5¾ pts.	27¼ lbs.	10.67	9.54	36.66
12	96.83	3.17	4 gals.6¾ pts.	1 lb. 7 oz.	96 gals. 4½ pts.	28 lbs. 7 oz.	11.62	9.32	37.33
13	96.69	3.31	4 gals.6¾ pts.	1½ lbs.	96 gals. 3¼ pts.	29 lbs. 10 oz.	12.57	9.12	38
14	96.55	3.45	4 gals.6½ pts.	1 lb. 9 oz.	96 gals. 2¼ pts.	30 lbs. 13 oz.	13.52	8.89	38.68
15	96.41	3.59	4 gals.6½ pts.	1 lb. 10 oz.	96 gals. 1 pt.	32 lbs.	14.46	8.67	39.35
16	96.27	3.73	4 gals.6½ pts.	1 lb. 11 oz.	96 gals.	33 lbs. 1 oz.	15.40	8.45	40.02
17	96 13	3 87	4 gals.6¼ pts.	1¾ lbs.	95 gals. 6¾ pts.	34 lbs. 5 oz.	16.34	8.24	40.69
18	95.99	4.01	4 gals.6¼ pts.	1 lb. 13 oz.	95 gals. 5½ pts.	35½ lbs.	17.33	8.02	41.35
19	95.85	4.15	4 gals.6¼ pts.	1 lb. 14 oz.	95 gals. 4½ pts.	36 lbs. 9 oz.	18.21	7.80	42.01
20	95.71	4.29	4 gals.6¼ pts.	1 lb. 15 oz.	95 gals. 3½ pts.	37¾ lbs.	19.14	7.59	42.68

BURNT ALMOND ICE-CREAM

Make a nut mix of the standard desired, in accordance with the tables on pages 293 to 295, omitting the nuts. Take of shelled almonds, the quantity of nuts specified in the table for the chosen standard.

Blanch the almonds (see page 94), and afterwards roast them until they are of a rich brown color.

Crush to powder in a mortar and, moistening with a little of the mix, rub into a smooth, soft paste. If mortar and pestle are not available, any strong container with a solid potato masher will do.

Stir this paste well into mix, and add enough True Bitter Almond flavoring extract or emulsion to give desired flavor, and sufficient Caramel Shade Brown dry color to make of proper shade.

Freeze, pack, etc., in same manner as other Ice-Creams.

CHESTNUT ICE-CREAM

Make a nut mix of the standard desired, in accordance with the tables on pages 293 to 295, omitting the nuts.

Take of shelled chestnuts, the quantity specified in the table for the chosen standard.

Boil chestnuts or roast them in oven until they are soft. Shell them and rub off the inner skin. Grind in mortar with enough of the mix to make a smooth paste. If mortar and pestle are not at hand, use a bowl and an ordinary solid potato masher.

When a mix is partly frozen, while dasher is revolving, add the chestnut pulp paste through fruit funnel.

Complete the freezing, hardening and packing in usual way.

FILBERT COFFEE ICE-CREAM

Make a nut mixture of the standard desired, in accordance with the tables on pages 293 to 295, omitting the nuts.

Add to it sufficient Zanzibar-Brand True Coffee Flavoring Paste to give it a good coffee flavor.

Take of shelled filberts the quantity of nuts specified in the table for the standard selected.

Blanch the filberts (see page 94). Roast them slightly in an oven and crush or grind to a fine powder.

When mix is nearly frozen, while dasher is revolving, slowly add crushed or powdered nuts to it and finish freezing.

HAZELNUT ICE-CREAM

Make a nut mix of the standard desired, in accordance with the tables on pages 293 to 295, omitting the nuts, add to it sufficient Imitation Maraschino flavoring or emulsion to give desired flavor.

Take of shelled hazelnuts, the quantity of nuts specified in the table for the standard selected. Blanch the hazelnuts (see page 94), and afterwards roast them for a few minutes in an oven. Crush or grind the nuts to a fine powder and add this to the mix.

Freeze, pack, etc. in usual way.

MAPLE WALNUT ICE-CREAM

Make a walnut mix of the standard desired in accordance with the tables on pages 293 to 295.

Add to it Imitation Maple flavoring or emulsion in the quantity required to give the desired flavor.

If the color is not deep enough it may be intensified by adding enough Caramel-Shade Brown dry color to make of preferred shade.

Freeze, harden and pack in usual way.

PECAN ICE-CREAM

Make a nut mix of the standard desired, in accordance with the tables on pages 293 to 295, omitting the nuts.

Add sufficient Carameline to flavor slightly.

Take of shelled pecans the quantity of nuts specified in the table for the standard selected. Crush the pecans or grind to a powder. Add to mix, and freeze, pack, etc. in usual way.

PISTACHIO ICE-CREAM

Make a nut Ice-Cream mix of the desired standard in accordance with the tables on pages 293 to 295, using pistachio nuts.

Before adding the nuts, flavor the mix to about half the strength desired with Imitation Pistachio flavoring or emulsion. Add a little True Bitter Almond flavoring extract or emulsion, and color to suit with Pistachio Shade Green color.

Blanch (see page 94) and grind nuts very fine and add them, through fruit funnel, while dasher is revolving, after mix is partly frozen.

If it is desired to make Pistachio Ice-Cream without the nuts, use the proportions of the standard vanilla mix entirely, only substituting the above flavors and color. Any nut that is not too strongly or distinctively flavored can be used instead of pistachio when the cost of nuts warrants it. In that case, flavor and color as above and crush or grind the nuts.

PEANUT BUTTER ICE-CREAM

Make a vanilla flavored nut mix (omitting nuts) of the standard desired in accordance with the tables on pages 293 to 295.

Color lightly with Caramel Shade Brown dry color.

Take of fresh peanut butter the quantity specified for nuts in the table.

Put mix in freezer. When nearly frozen add the peanut butter.

FRUIT NOUGATINE

Make a fruit mix (omitting the fruit) of the standard desired, in accordance with one of the tables numbered I (for strawberries, etc.) in the series of tables on pages 270 to 278.

Flavor the mix with Tutti Frutti flavoring extract or emulsion.

Take of any available fruit—peaches, pineapple, cherries, or berry fruits—either cold pack (2 to 1) or fresh fruit to which one-half its weight of sugar has been added:

For 100 lb. mix.....12 lbs.
For 5-gal. mix .....4¼ pts.
For 100-gal. mix .....10¾ gals.

Take of mixed nuts, chopped, but not too fine:

	Quantity of chopped nuts.				
	7% standard	8% standard	10% standard	12% standard	14% standard
For 100-lb. mix (pounds)..	2.33	2.55	3	3.45	3.90
For 5-gal. mix (pounds)...	1	1	1¼	1¼	1½
For 100-gal. mix (pounds).	19	20¼	23¼	26	28¾

Put mix in freezer. When nearly frozen, while dasher revolves, add first the fruit and then the nuts.

A combination of fruits may be used instead of a single fruit, such as pineapple, orange pulp and shredded cocoanut in equal parts, or peaches, bananas and sour cherries, also in equal parts. The fruit should always be crushed, and should be of varieties the flavors of which blend well: that is, one acid fruit with any blendable combination of other fruits. If fresh fruit is used instead of cold packed (2 to 1) add one-half its weight of sugar, as above.

CHOP SUEY ICE-CREAM

Make a fruit mix (omitting the fruit) of the standard desired, in accordance with one of the tables numbered III (for pineapple, plums, etc.) on pages 270 to 279.

Flavor the mix with Imitation Tutti Frutti flavoring extract or emulsion.

Take fruit and nuts to the amount named for fruit in the table for the standard selected, consisting of equal parts of dates, figs and walnuts (15¾ oz. of walnuts being equivalent to one pint of fruit). Chop them, but not too fine.

Put mix in freezer. When it is nearly frozen add fruits and nuts.

BISQUE ICE-CREAM

(Sometimes spelled Bisk.)

Bisque Ice-Creams as a class are those to which cake, a confection or some similar material is added. Such additions may be made alone or in combination with fruit or nuts—either with the regular vanilla mix or with a Neapolitan or a Vienna mix, as preferred.

Marshmallow Ice-Creams are a distinctive class of Bisque Ice-Cream. Formulas for the principal varieties of Marshmallow Ice-Creams follow a selection of general bisque formulas, made with the regular vanilla mix. Other bisque formulas used with Neapolitan mix follow the Neapolitan nut formulas.

Bisque Glacé or Bisquit Glacé (biscuit glacé) should be carefully distinguished from Bisque Ice-Cream especially since the terms are frequently used interchangeably.

A bisquit glacé is a special kind of Ice-Cream, made in a different way from any other, generally used as a foundation for a fruit, a nut or a bisque Ice-Cream of peculiar fineness.

STANDARD BISQUE ICE-CREAM

Make the quantity of a regular vanilla mix of the desired standard as required in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	88.44	87.91	86.71	85.23	83.38
For 5-gal. mix	4 gals. 3½ pts.	4 gals. 3 pts.	4 gals. 2¾ pts.	4 gals. 2¼ pts.	4 gals. 1½ pts
For 100-gal. mix	88 gals. 3½ pts.	87 gals. 7¼ pts.	86 gals. 5¾ pts.	85¼ gals.	83 gals. 3 pts.

Add to the mix the quantity of 30 per cent. cream specified for the same standard in the following table:

	Quantity of 30 per cent. Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	2.70	3.23	4.43	5.91	7.76
For 5-gal. mix	1¼ pts.	1½ pts.	2 pts.	2¾ pts.	3¾ pts.
For 100-gal. mix	2 gals. 7½ pts.	3½ gals.	4 gals. 6½ pts.	6 gals. 3 pts.	9 gals. 1¼ pts

The regular mix and cream thus combined make a regular bisque mix usable in many bisque formulas.

Flavor mix to taste, with vanilla flavoring, and add a little True Bitter Almond flavoring extract.

For 100-lb. mix	Dry sponge cake	4.43 lbs.
	Macaroons	4.43 lbs.
For 5-gal. mix	Dry sponge cake	2 lbs.
	Macaroons	2 lbs.
For 100-gal. mix	Dry sponge cake	40 lbs.
	Macaroons	40 lbs.

Lady fingers, meringue (see formula, page 383), or any plain, easily crumbled cake may be used instead of sponge cake. The macaroons are best when almond flavored. If cake and macaroons are not dry enough to crumble readily, heat in oven until they are.

Crush or grate cake and macaroons to a coarse powder. A convenient way is to pulverize on bread board with rolling pin.

Put mix in freezer. When nearly frozen, while dasher revolves, add powdered cake and macaroons through fruit funnel.

Finish freezing, hardening and packing in usual way.

In Alabama, Tennessee and West Virginia it is not necessary to restore the milk-fat displaced by the cake and macaroons. Therefore, for this bisque Ice-Cream made, sold or used within any one of those states, instead of combining regular mix with cream, use the following quantities of regular 8 per cent. vanilla mix and omit the added cream:

For 100-lb. mix	91.14 lbs.
For 5-gal. mix	4 gals. 4½ pts.
For 100-gal. mix	91 gals., 1¼ pts.

In all other respects follow above directions.

This same method may also be used where there is no legal standard for Ice-Cream.

BROWN BREAD ICE-CREAM

Make a regular bisque mix of the standard desired, in the manner directed on pages 300 to 301.

Flavor the mix with vanilla flavoring and color to suit with Caramel Shade Brown dry color.

Take of brown bread:

For 100-lb. mix	11.67 lbs.
For 5-gal. mix	5 one-pound loaves.
For 100-gal. mix	100 one-pound loaves

Cut bread into slices about one-half inch thick. Dry in oven, if necessary: toast, grate and pass through sieve. The drying and toasting reduce the weight about 20 per cent.

Boston brown bread is usually preferred, but whole wheat, graham or any other brown bread may be used in making this Ice-Cream.

Put mix in freezer. When it is nearly frozen, while dasher revolves, add grated toast.

Complete the freezing, hardening and packing in usual way.

BUTTER SCOTCH ICE-CREAM

Make butter-scotch according to the formula on page 383:

For 100-lb. mix .....20 lbs.
For 5-gal. mix .....1 gal.
For 100-gal. mix .....20 gals.

Make the quantity of a standard vanilla mix required in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	73.913	72.727	70	66.667	62.50
For 5-gal. mix	3 gals. 5½ pts.	3 gals. 5 pts.	3½ gals.	3 gals. 2½ pts.	3 gals.
For 100-gal. mix	73 gals. 7¼ pts.	72 gals. 5¾ pts.	70 gals.	66 gals. 5¼ pts.	62½ gals.

Put mix in freezer. When it is partly frozen add 30 per cent. cream as follows:

	Quantity of 30 per cent. Cream				
	For 7% mix	For 8% mix	For 10% mix	For 12% mix	For 14% mix
For 100-lb. mix (pounds)	6.087	7.273	10	13.333	17.50
For 5-gal. mix	2½ pts.	3 pts.	½ gal.	5½ pts.	1 gal.
For 100-gal. mix	6 gals. ¾ pt.	7 gals. 2¼ pts.	10 gals.	13 gals. 2¾ pts.	17½ gals.

When mix is nearly frozen add butter-scotch. Complete the freezing, hardening and packing in usual way.

Alabama and Tennessee allow a reduction of milk-fat below the 8 per cent. standard when the reduction is caused by the addition of a confection. Therefore, for this Ice-Cream, made, sold or used in either of those states, do not combine regular mix with cream as above directed but use instead the following quantities of the regular 8 per cent. vanilla mix and omit the added cream.

For 100-lb. mix .....80 lbs.
For 5-gal. mix .....4 gals.
For 100-gal. mix .....80 gals.

In all other respects follow the foregoing directions.

This same method may also be used where there is no legal standard for Ice-Cream.

GINGER ICE-CREAM

Make the quantity of regular vanilla mix of the desired standard named for that standard in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.43	93.14	92.45	91.61	90.56
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts
For 100-gal. mix	93 gals. 3½ pts.	93 gals. 1¼ pts.	92 gals. 2½ pts.	91 gals. 5 pts.	90 gals. 4½ pts.

To this add the quantity of 30 per cent. cream named for the same standard in the following table:

	Quantity of 30 per cent. Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	1.54	1.83	2.52	3.36	4.41
For 5-gal. mix	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix	1 gal. 5½ pts.	2 gals.	2¾ gals.	3 gals. 5 pts.	4 gals. 5¾ pts.

Add enough Jamaica ginger to give a flavor about half as strong as desired. The candied ginger to be added will complete the flavor. Also add sufficient Caramel Shade Brown dry color to make it of desired shade.

Quantity of candied or crystallized ginger needed:

For 100-lb. mix .....4.44 lbs.
For 5-gal. mix .....2 lbs.
For 100-gal. mix .....40 lbs.

Chop ginger fine and sprinkle with a little True Royal Lemon extract.

Put mix in freezer. When nearly frozen, while dasher revolves, slowly add ginger through fruit funnel.

Complete the freezing, hardening and packing in usual way.

Alabama and Tennessee allow a reduction of milk-fat below the 8 per cent. standard when the reduction is caused by the addition of a confection. Therefore, for this Ice-Cream, made, sold or used in either of those states, do not combine regular mix with cream as above directed, but use instead the following quantities of the regular 8 per cent. vanilla mix and omit the added cream:

For 100-lb. mix ..... 95.56 lbs.
For 5-gal. mix ..... 4 gals., 6¼ pts.
For 100-gal. mix ..... 95 gals., 4½ pts.

In all other respects follow the foregoing directions.

This same method may also be used where there is no legal standard for Ice-Cream.

GRAPENUT ICE-CREAM

Make a regular vanilla mix of the desired standard:

For 100-lb. mix ..... 95.57 lbs.
For 5-gal. mix ..... 4 gals., 6¼ pts.
For 100-gal. mix ..... 95 gals. 4¾ pts.

Flavor to taste with vanilla flavoring and color to suit with Yellow Liquid Color for Ice-Cream.

Take of Grapenuts:

For 100-lb. mix ..... 4.43 lbs.
For 5-gal. mix ..... 2¾, 12-oz. packages
For 100-gal. mix ..... 53½ 12-oz. packages

Put mix in freezer. When nearly frozen, while dasher revolves, add Grapenuts through fruit funnel. Complete the freezing, hardening, and packing in usual way

When official regulation permits no reduction of the fat standard on account of this addition, then instead of the quantity of vanilla mix named above, use the quantity of regular vanilla mix specified for the desired standard in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.43	93.14	92.45	91.61	90.56
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts.
For 100-gal. mix	93 gals. 3½ pts.	93 gals. 1¼ pts.	92 gals. 3½ pts.	91 gals. 5 pts.	90 gals. 4½ pts.

To this add the quantity of 30 per cent. cream for the same standard in the following table:

	Quantity of 30% Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	1.54	1.83	2.52	3.36	4.41
For 5-gal. mix	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix	1 gal. 5½ pts.	2 gals.	2¾ gals.	3 gals. 5 pts.	4 gals. 5¾ pts.

In all other respects follow the above directions.

USE OF MARSHMALLOWS IN ICE-CREAM

A pleasing form of bisque can be made by incorporating market marshmallows with the regular mix. The average Ice-Cream maker would best buy fresh stock as required. In large operations and where good marshmallows are not available, it may be profitable to make them as needed.

Recipe for Standard Marshmallows

7½ lbs. granulated sugar,
7½ lbs. corn sirup,
5½ oz. high-grade gelatin,
5 pts. water.

Fill starch trays, at least 1¾ inches deep, level full of molding starch and place them in an oven or other hot place over night to dry without scorching. Starch re-absorbs moisture quickly. It is important, therefore, that the trays be kept drying until actually used, and the starch must be at room temperature (not over 90 degrees F.) when used.

Soak the gelatin in half the water at room temperature for a period of 5 minutes to soften it: then heat and stir it in a double boiler until it is completely "dissolved." A temperature of 120 to 130 F. is best: above 160, the gelatin will lose strength.

Put the gelatin "solution" into a beater, add the sugar, the corn sirup, and the remaining half of the water, and turn on the power or beat by hand, first slowly and increasing the speed when the danger of splashing is passed. If a uniform speed is maintained, keep out the second half of the water until the swell has started. Then either let it run in in a thin stream or add one-third of it at intervals until the whole has been beaten into the desired degree of whiteness and volume of swell. A power beater at uniform rate of speed takes about an hour to whip in a 250 per cent. swell: that is, to increase it to 3½ times the original volume. This makes a light marshmallow and the gelatin is enough to hold the swell under proper handling. If the beating continues beyond that point, the swell will be beaten out. A power beater would be an economical investment, especially if fancy Ice-Creams are frequently made.

Meanwhile, press mold holes into the starch, in the trays. This is done with dice or other convenient forms glued on a mold board. The forms should not exceed an inch in height, as plenty of starch must be left under them to absorb the moisture of the casting.

Drop the whipped mixture into the starch molds, either with a funnel-shaped paper dropper or with a dropping machine, filling the holes level full. Dust a mixture of equal parts starch and powdered sugar over the top and place the trays in a dry room, at room temperature, preferably 69 to 75 degrees F. When the starch has absorbed enough of the moisture of the marshmallows to make them fit to be handled, remove them from the molds, brush off the starch, and use them as required. The drying may be completed over night if the starch had a moisture content of not over 5 per cent.

Marshmallows are flavored to taste with vanilla when the swell has nearly reached the desired volume. The beating is then continued until the flavor is evenly distributed.

Recipe for Marshmallow Without Gelatin

1 gallon egg whites,
15 lbs. granulated sugar,
1 lb. corn starch,
½ teaspoonful citric acid crystals,
Vanilla flavoring to taste.

Mix egg whites, sugar, corn-starch and citric acid crystals, stirring vigorously.

Heat in steam-jacketed kettle or over water until mixture is hot.

Take from fire. Beat until stiff: then beat in the vanilla flavoring and proceed as for standard marshmallows.

MARSHMALLOW ICE-CREAM

Make a regular vanilla mix of the desired standard:

For 100-lb. mix	95.56 lbs.
For 5-gal. mix	4 gals. 6¼ pts.
For 100-gal. mix	95 gals. 4½ pts.

Flavor well with vanilla flavoring. Color with Yellow Liquid Color for Ice-Cream.

Take of fresh marshmallows:

For 100-lb. mix	4.43 lbs.
For 5-gal. mix	2 lbs.
For 100-gal. mix	40 lbs.

Cut marshmallows into small cubes, preferably using a chopping knife and bowl.

Put mix into freezer and when it is partly frozen, while dasher revolves, add chopped marshmallows through fruit funnel.

Complete the freezing, hardening and packing in usual way.

Ice-Cream thus made, using 8 per cent. regular mix, is standard in Alabama and Tennessee, and also (using whatever standard of regular mix preferred) may be made, sold and used wherever there is no legal standard.

When official regulation permits no reduction of the fat standard on account of this addition, then instead of the quantity of regular vanilla mix named above, use the quantity of regular vanilla mix specified for the desired standard in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.43	93.14	92.45	91.61	90.56
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts.
For 100-gals. mix	93 gals. 3½ pts.	93 gals. 1¼ pts.	92 gals. 3½ pts.	91 gals. 5 pts.	90 gals. 4½ pts.

To this add the quantity of 30 per cent. cream named for the selected standard in the following table:

	Quantity of 30% Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	1.54	1.83	2.52	3.36	4.41
For 5-gal. mix	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix	1 gal. 5½ pts.	2 gals.	2¾ gals.	3 gals. 5 pts.	4 gals. 5¾ pts.

In all other respects follow the above directions.

CHOCOLATE MARSHMALLOW ICE-CREAM

Make a chocolate mix of the desired standard according to the tables on pages 262 to 264.

For 100-lb. mix .....95.56 lbs.
For 5-gal. mix .....4 gals. 6½ pts.
For 100-gal. mix .....95 gals. 4½ pts.

Color mix to desired shade with Chocolate Shade Dark Brown dry color.

Take of fresh marshmallows:

For 100-lb. mix .....4.44 lbs.
For 5-gal. mix .....2 lbs.
For 100-gal. mix .....40 lbs.

Cut marshmallows into small cubes or pieces.

Put mix in freezer. When nearly frozen, while dasher revolves, add marshmallows through fruit funnel.

Complete the freezing, hardening and packing in usual way.

Ice-Cream thus made, using 8 per cent. regular mix, is standard in Alabama and Tennessee, and also (using whatever standard of regular mix preferred) may be made, sold and used wherever there is no legal standard.

When official regulation permits no reduction of the fat standard on account of this addition, then instead of the quantity of regular chocolate mix named above, use the quantity of regular chocolate mix specified for the desired standard in the following table:

	Quantity of regular chocolate mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.43	93.14	92.45	91.61	90.56
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts.
For 100-gal. mix	93 gals. 3½ pts.	93 gals. 1¼ pts.	92 gals. 3½ pts.	91 gals. 5 pts.	90 gals. 4½ pts.

To this add the quantity of 30 per cent. cream named for the selected standard in the following table:

	Quantity of 30% Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	1.54	1.83	2.52	3.36	4.41
For 5-gal. mix	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix	1 gal. 5½ pts.	2 gals.	2¾ gals.	3 gals. 5 pts.	4 gals. 5¾ pts.

In all other respects follow the above directions.

MAPLE MARSHMALLOW MIX

Proceed exactly as when making a plain Marshmallow Ice-Cream according to formula on pages 306 to 307, except instead of the flavoring and coloring there specified, flavor to taste with Imitation Maple flavoring extract or emulsion and color to desired shade with Maple Shade Brown dry color.

MARSHMALLOW NUT ICE-CREAM

Make a regular vanilla mix of the desired standard:

For 100-lb. mix.....93.35 lbs.
For 5-gal. mix.....4 gals. 5½ pts.
For 100-gal. mix .....93 gals. 2¾ pts.

Flavor well with vanilla. Color to suit with Yellow Liquid Color for Ice-Cream, except where pistachio nuts are to be added: in that case color lightly with Pistachio Shade Green liquid or dry color.

Take of nut meats and fresh marshmallows the following quantities·

For 100-pound mix.. { Nut meats .....2.22 lbs.
Marshmallows ..... 4.43 lbs.

For 5-gal. mix..... { Nut meats .....1 lb.
Marshmallows ..... 2 lbs.

For 100-gal. mix..... { Nut meats .....20 lbs.
Marshmallows ..... 40 lbs.

Any kind of nuts preferred, or a combination of two or more nuts the flavors of which blend well, may be used. Chop or break nuts into pieces. Cut marshmallows into small cubes or pieces.

Put mix in freezer. When nearly frozen, while dasher revolves, add nuts and marshmallows through fruit funnel. Complete the freezing, hardening and packing in usual way.

Ice-Cream thus made, using 8 per cent. regular mix, is standard in Alabama, and Tennessee, and also (using whatever standard of regular mix preferred) may be made, sold and used wherever there is no legal standard.

Where a reduction in milk fat content is allowed because of the additions of nuts (except in Alabama, Tennessee and West Virginia) use, instead of the regular vanilla mix, the same quantity of a nut mix "Without Restoring Lowered Milk Solids" (see page 295) of the desired standard.

Where no reduction in milk-fat is permitted because of addition of nuts, etc., instead of the quantity of regular mix specified above, use the quantity named for the desired standard in the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	91.04	90.61	89.57	88.31	86.72
For 5-gal. mix	4 gals. 4½ pts.	4 gals. 4¼ pts.	4½ gals.	4 gals. 3½ pts.	4 gals. 2¾ pts.
For 100-gal. mix	91 gal. ½ pt.	90 gals. 5 pts.	89 gals. 4½ pts.	88 gals. 2¼ pts.	86 gals. 5¾ pts.

Take also the quantity of 30 per cent. cream named for the standard selected in the following table:

	Quantity of 30 per cent. Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	2.31	2.75	3.78	5.04	6.63
For 5-gal. mix	1¼ pts.	1½ pts.	1¾ pts.	2¼ pts.	3 pts.
For 100-gal. mix	2 gals. 4¼ pts.	3 gals. 3¼ pts.	4 gals. ½ pt.	5 gals. 3¼ pts.	7 gals. 1 pt.

Combine this regular vanilla mix and cream, using it instead of the quantity of regular mix specified at beginning of formula. In all other respects follow above directions.

In West Virginia use, instead of the quantity of regular mix first named, a combination of 8 per cent. regular vanilla mix and 30 per cent. cream as follows:

For 100-pound mix..{Regular 8% mix.....91.52 lbs.
Cream, 30% .....1.83 lbs.

For 5-gal. mix.....{Regular 8% mix....4 gals. 4¾ pts.
Cream 30% .....1¼ pts.

For 100-gal. mix.....{Regular 8% mix..91 gals. 4¼ pts.
Cream, 30% .....2¾ gals.

In other respects follow directions first above given.

CHERRY MARSHMALLOW ICE-CREAM

Make a regular fruit mix of the desired standard, without the fruit, in accordance with one of the tables Numbered IV (for cherries, etc.) on pages 270 to 279.

Flavor, first, with vanilla flavoring and then slightly with Imitation Cherry flavoring extract or emulsion. Color lightly with Cherry Shade Red Liquid or dry color.

Take of fresh marshmallows:

For 100-lb. mix.....4.43 lbs.
For 5-gal. mix .....2 lbs.
For 100-gal. mix .....40 lbs.

Cut marshmallows into small cubes or pieces.

Take of cold pack (2 to 1) cherries:

For 100-lb. mix .....8.50 lbs.
For 5-gal. mix .....3¼ pts.
For 100-gal. mix .....7¾ gals.

Fresh fruit or fruit preserved in other ways than by cold packing 2 to 1 (that is, two pounds of fruit to one of sugar) may be used if first adapted for such use in accordance with directions on page 280.

Take of 30 per cent. cream the quantity named for the selected standard in the following table:

	Quantity of 30 per cent. Cream						
	For 6% standard	For 7% standard	For 8% standard	For 9% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	0.90	1.05	1.20	1.35	1.50	1.80	2.10
For 5-gal. mix (fl. oz.)	1	1	1¼	1¼	1½	1¾	2
For 100-gal. mix (pts.)	1	1¼	1½	1½	1¾	2	2½

Add the cream to the mix and put into freezer. When nearly frozen, add first the cherries and then the marshmallows. Complete the freezing, hardening and packing in usual way.

In Alabama and Tennessee it is not necessary to add the cream to the mix, but the quantity of fruit used should be as follows:

For 100-lb. mix .....9.70 lbs.
For 5-gal. mix .....3½ pts.
For 100-gal. mix .....8 gals. 7 pts.

OTHER MARSHMALLOW FRUIT ICE-CREAMS

Any fruit desired may be used in place of cherries, the mix and Ice-Cream being made in precisely the same way, except that the flavoring extract or emulsion used in addition to the vanilla flavoring must be that of the fruit used and the color must be the color for the fruit as shown in table on pages 100 and 101.

Several fruits may be used in combination in the same way, provided their flavors blend well. In that case, use Imitation Tutti Frutti flavoring extract or emulsion and tint lightly with the color of the deepest colored fruit.

NEAPOLITAN ICE-CREAM

Also Known as **New York Ice-Cream**

Neapolitan Ice-Cream originated in Italy, whence its name. It differs from "Philadelphia" or standard Ice-Cream in that it contains whole eggs. These, or at least the yolks of them, should be cooked to avoid a raw egg flavor, which is unpleasant to some.

FORMULAS FOR CUSTARDS

Made with Whole Eggs

for New York or Neapolitan Ice-Creams

Standard of mix and of Ice-Cream (per cent. milk fat)	Ingredients	For 100-lb. mix[1] (pounds)	For 5-gallon mix	For 100-gallon mix
7	Whole egg	1.424	7 eggs (9¾ fl. oz.)	140 eggs (1½ gals.)
	Whole milk	3.346	1¼ pts.	3 gals. 4¼ pts.
	Cream, 30%	1.327	¾ pt.	1 gal. 3¾ pts.
	Granulated sugar	1.022	7½ oz.	9 lbs. 5 oz.
8	Whole egg	1.632	8 eggs (11 fl. oz.)	160 eggs (1 gal. 5¾ pts.)
	Whole milk	3.043	1 pt.	3 gals. ¼ pt.
	Cream, 30%	1.716	1 pt.	1 gal. ¾ pt.
	Granulated sugar	1.047	7½ oz.	9½ lbs.
10	Whole egg	2.05	10 eggs (13¾ fl. oz.)	200 eggs (2 gals. 1¼ pts.)
	Whole milk	3.115	1¼ pts.	3 gals. 2¼ pts.
	Cream, 30%	2.744	1¾ pts.	2 gals. 7¾ pts.
	Granulated sugar	1.258	9 oz.	11 lbs. 6 oz.
12	Whole egg	2.47	12 eggs (16½ fl. oz.)	240 eggs (2 gals. 4¾ pts.)
	Whole milk	2.944	1¼ pts.	3 gals. ½ pt.
	Cream, 30%	4.10	1¾ pts.	4 gals. 7½ pts.
	Granulated sugar	1.472	10¾ oz.	13¼ lbs.
14	Whole egg	2.896	14 eggs (19½ fl. oz).	280 eggs (3 gals. ¼ pt.)
	Whole milk	2.511	1 pt.	2 gals. 5 pts.
	Cream, 30%	5.723	2½ pts.	6 gals. 1 pt.
	Granulated sugar	1.671	¾ lb.	15 lbs.
Special 8% for Ala., N. J., Tenn., W. Va.	Whole egg	1.632	8 eggs (11 fl. oz.)	160 eggs (1 gal. 5¾ pts.)
	Whole milk	3.567	1½ pt.	3¾ gals.
	Cream, 30%	1.192	½ pt.	1¼ gals.
	Granulated sugar	1.047	7½ oz.	9½ lbs.

[1]The difference between the total of these quantities and 100 pounds is the quantity of regular vanilla mix to be used. For example, the total weight of the custard ingredients for the 10 per cent. standard is 9.167 pounds, according to the above table. Deducting that from 100 pounds leaves 90.833 pounds of regular 10 per cent. vanilla mix to be added to the 9.167 pounds custard to make 100 pounds New York or Neapolitan Ice-Cream of 10 per cent. standard. The 5-gallon and 100-gallon columns are used in a similar manner.

The best way to make New York or Neapolitan Ice-Cream is to add a custard, made of eggs and a small quantity of milk, cream and sugar, to the regular vanilla mix. This gives a tastier Ice-Cream than is obtained when all the milk products in the mix are cooked with the eggs, and as a manufacturing proposition is easier. This same custard may also be used in many frozen puddings and frozen specialties.

The preceding formulas for custards are for the standards of Ice-Cream most used. These standards are also those that are statutory. All the milk fat and sugar and very nearly all the milk-solids-not-fat displaced by the eggs, are restored, so that, for instance, a 10 per cent. custard with a 10 per cent. regular mix will give a 10 per cent. Ice-Cream.

Alabama, New Jersey, Tennessee and West Virginia allow a reduction in milk fat where eggs are added, and, therefore, a special formula with the milk fat reduced accordingly is provided for use in those states with the regular 8 per cent. vanilla mix.

These custard formulas are so calculated that any milk containing 3% or more milk-fat or butter-fat may be used in them without reducing the milk fat content below legal standard, provided the mixes with which they are used are up to standard.

Directions for making—Beat the eggs; add the sugar and beat again. Stir into the milk and cream and repeat stirring frequently. Cook slowly over water or in a steam-jacket kettle until it makes a thick coating on a knife blade. Then remove from fire, flavor to taste with vanilla extract, strain and cool.

Do not permit to boil, as that may curdle the milk and cream. If necessary to prevent boiling remove from fire occasionally.

This custard is ready for use as soon as cool, but it makes a better Ice-Cream if allowed to stand in a cool place for twenty-four hours before using.

Chinese powdered eggs and dried or desiccated eggs of any kind, either whole, whites or yolks, should not be used in an Ice-Cream custard. For best results use fresh eggs.

NEW YORK OR NEAPOLITAN VANILLA ICE-CREAM

Make a custard for the desired standard, in accordance with the formula on opposite page.

Make a regular vanilla mix of the desired standard:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	92.881	92.562	90.833	89.014	87.199
For 5-gal. mix	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¼ pts.	4 gals. 3¾ pts.	4 gals. 3 pts.
For 100-gal. mix	92 gals. 7 pts.	92 gals. 4½ pts.	90 gals. 6¾ pts.	89 gals. ¼ pt.	87 gals. 1¾ pts.

Color to desired shade with Yolk-Em Egg Shade liquid or dry color. When mix is nearly frozen add custard slowly and complete freezing.

NEW YORK OR NEAPOLITAN CHOCOLATE ICE-CREAM

Use a chocolate mix, made in accordance with the tables and directions on pages 261 to 264, instead of a vanilla mix. Make in the same manner, in other respects, as the New York or Neapolitan Vanilla Ice-Cream (see formula above), except that the mix should be colored to suit with Chocolate Shade Brown dry color.

NEW YORK OR NEAPOLITAN MAPLE ICE-CREAM

Make in all respects the same as New York or Neapolitan Vanilla Ice-Cream (on preceding page) except that it should be flavored to taste with Imitation Maple flavoring extract or emulsion and colored to suit with Maple Shade Brown dry color.

NEW YORK OR NEAPOLITAN FRUIT ICE CREAM

New York or Neapolitan Fruit Ice-Cream is made in the same way as a standard Fruit Ice-Cream, in accordance with the tables on pages 270 to 279, except that a New York or Neapolitan mix, with custard added, made according to formula on pages 312 to 313, is used instead of the regular vanilla mix.

NEW YORK OR NEAPOLITAN NUT ICE-CREAM

New York or Neapolitan Nut Ice-Cream is made in the same way as a standard Nut Ice-Cream, in accordance with tables on pages 293 to 295, except that a New York or Neapolitan mix, with custard added, made according to formula on pages 312 to 313, is used instead of the regular mix.

PEACH CREAM SURPRISE

Make a New York or Neapolitan Ice-Cream mix of desired standard (see formula on pages 312 and 313).

For 100-lb. mix	90.56 lbs.
For 5-gal. mix	4 gals. 4½ pts.
For 100-gal. mix	90 gals. 4½ pts.

Flavor it to taste with Imitation Peach Flavoring extract or emulsion. Color it a rich rose shade with Brilliant Rose Shade Pink liquid or dry color.

Take:

For 100-lb. mix ..... { Cream, 30 per cent.....4.41 lbs.
Canned sliced peaches ....4.43 lbs.

For 5-gal. mix ..... { Cream, 30 per cent.....2 pts.
Canned sliced peaches.....2 lbs.

For 100-gal. mix..... { Cream, 30 per cent..4 gals. 5¾ pts.
Canned sliced peaches.....40 lbs.

Put mix into freezer, when nearly frozen, while paddles are revolving, add through fruit funnel first the cream and then the peaches.

Complete the freezing, hardening and packing in usual way.

This Ice-Cream will be of 14 per cent. standard if a 14 per cent. New York or Neapolitan mix is used. With a lower standard mix it will be slightly above standard.

ALMOND PISTACHIO ICE-CREAM

Make with blanched almonds a New York or Neapolitan Nut Ice-Cream in accordance with the formula on opposite page.

Flavor the mix, to taste, with True Bitter Almond flavoring extract or Imitation Pistachio flavoring extract or emulsion. Color lightly with Pistachio Shade Green liquid or dry color.

TUTTI FRUTTI ICE-CREAM, No. 1

Also known as Fruited Plombiere.

Make a New York or Neapolitan Ice-Cream mix of the standard desired, in accordance with the formula on pages 312 and 313.

For 100-lb. mix ..... 76.377 lbs.
For 5-gal. mix .....3 gals. 6¾ pts.
For 100-gal. mix ..... 76 gals. 3¼ pts.

Flavor with Imitation Tutti Frutti flavoring extract or emulsion. Color with Yellow Liquid Color for Ice-Cream or Yolk-Em Egg Color.

Take:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Candied white pineapple	3.321 lbs.	1½ lbs.	30 lbs.
Candied red pineapple	3.321 lbs.	1½ lbs.	30 lbs.
Candied cherries	3.321 lbs.	1½ lbs.	30 lbs.
Candied angelica stalks	4.421 lbs.	2 lbs.	40 lbs.
Cream, 30 per cent	9.249 lbs.	4 pts.	10 gals.

Cut candied fruit into small cubes or pieces.

Put mix in freezer. When about half frozen, while dasher revolves, add cream and, later when nearly frozen, add candied fruit through fruit funnel. Complete the freezing, hardening and packing in usual way.

If a 14 per cent. milk-fat standard New York or Neapolitan mix is used, the Ice-Cream will contain full 14 per cent. milk fat: if a lower standard New York or Neapolitan mix is used the Ice-Cream will have a milk-fat content slightly in excess of that standard.

TUTTI FRUTTI ICE-CREAM, No. 2

Make in the same manner as Tutti-Frutti Ice-Cream No. 1 except that, for the combination of fruits there named, substitue the following:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
English walnuts	2.22 lbs.	1 lb.	20 lbs.
Pecans	2.22 lbs.	1 lb.	20 lbs.
Candied pineapple	2.22 lbs.	1 lb.	20 lbs.
Candied Citron	2.22 lbs.	1 lb.	20 lbs.
Cleaned currants	2.22 lbs.	1 lb.	20 lbs.
Sultanna raisins	1.11 lbs.	½ lb.	10 lbs.
Candied cherries	2.22 lbs.	1 lb.	20 lbs.

Break nuts into small pieces; cut candied fruits into small cubes. The flavor is improved if raisins and currants are soaked over night in Imitation Rum flavoring extract.

TUTTI FRUTTI ICE-CREAM, No. 3

Make in the same manner as Tutti Frutti Ice-Cream No. 1 except that for the combination of fruits there named substitute a Tutti Frutti mixture made as follows:

First take:

For 100-lb. mix..... { 1.662 lbs. seedless or seeded raisins,
1.662 lbs. prunes.

For 5-gal. mix..... { ¾ lb. seedless or seeded raisins,
¾ lb. prunes.

For 100-gal. mix.... { 15 lbs. seedless or seeded raisins,
15 lbs. prunes.

Cook raisins and prunes together in enough water to cover them until the prunes are tender. Then pass through sieve, discard prune pits, and return the raisins and prunes to stove to keep them warm.

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Peaches	1.108 lbs.	½ pt.	1 gal. 1½ pts.
Apricots	1.108 lbs.	½ pt.	1 gal. 1½ pts.
Maraschino cherries	1.108 lbs.	½ pt.	1 gal. ½ pt.
Grated pineapple	1.385 lbs.	¾ pt.	1 gal. 3½ pts.
Orange pulp and juice	1.385 lbs.	¾ pt.	1½ gals.
Walnut or pecan meats	1.108 lbs.	1 l[illegible]	10 lbs.

Use canned fruit with sirup, chop it, and grind the nuts (not too finely).

Add this mixture to the first while it is still hot and mix thoroughly.

WALDORF ICE-CREAM

18 per cent. milk fat.

Make a 14 per cent. standard custard (of whole eggs) in accordance with the formula on pages 312 and 313.

Make a 20 per cent. regular vanilla mix:

For 100-pound mix.....75.371 pounds.
For 5-gallon mix .....3¾ gals.
For 100-gallon mix .....75 gals. 3¼ pts.

A mix of a lower standard would not provide sufficient milk fat for a Waldorf Ice-Cream.

Add sufficient True Bitter Almond flavoring extract to give a good almond flavor, and a little True Lemon extract or emulsion to make the flavor zestful. Be careful not to use too much flavoring. Color a deep cream or light yellow shade with Yolk-Em Egg Shade Color.

Add the custard to the mix, and put into freezer.

Mix well together:

For the 100-lb. mix....{Cream, 30 per cent.....7.314 lbs.
Powdered sugar .....3.299 lbs.

For the 5-gal. mix.....{Cream, 30 per cent.....3¼ pts.
Powdered sugar .....1 lb. 7½ oz.

For the 100-gal. mix..{Cream, 30 per cent.....7 gals. 6¾ pts.
Powdered sugar ..... 29¼ lbs.

When mix is about half frozen, add this mixture of cream and sugar to it. Continue freezing.

Blanch shelled almonds (in the manner directed on page 94), and chop them medium fine, in the following proportion.

For 100-lb. mix.....1.127 pounds.
For 5-gallon mix.....½ pound.
For 100-gallon mix.....10 pounds.

When the mix is very nearly frozen, add almonds. Finish freezing, harden and pack in the usual way.

MANHATTAN ICE-CREAM

Make a New York or Neapolitan Fruit Ice-Cream mix (without the fruit) of the desired standard in accordance with the formula on page 314, using in compounding it one of the tables, numbered I (for strawberries, etc.) calling for the largest quantity of fruit in the fruit tables on pages 270 to 278.

Flavor mix with Imitation Tutti Frutti flavoring extract or emulsion. Color with Yolk-Em Egg Shade liquid or dry color.

Put mix into freezer, and when it is nearly frozen, while dasher revolves, add through the fruit funnel:

For 100-lb. mix..... { Orange juice .....9.67 lbs.
Lemon juice .....2.156 lbs.

For 5-gal. mix..... { Orange juice .....4 pts.
Lemon juice .....1 pt.

For 100-gal. mix..... { Orange juice .....10 gals.
Lemon juice .....2½ gals.

About 15 oranges and 5 lemons will provide the juice (and pulp) for the 5-gallon mix, while for the 100-gallon mix about 25 dozen oranges and 8 dozen lemons will be required. Peel and seed them, removing all the white inner skin to prevent bitterness, and squeeze out juice and pulp.

Continue freezing until this is thoroughly mixed in and then, while the dasher continues turning, add nut meats chopped medium fine as follows:

For 100-lb. mix..... { Walnut meats .....1.660 lbs.
Pecan meats .....1.660 lbs.

For 5-gal. mix..... { Walnut meats .....¾ lb.
Pecan meats .....¾ lb.

For 100-gal. mix..... { Walnut meats ..... 15 lbs.
Pecan meats ..... 15 lbs.

Also add the quantity of crushed assorted fruits (cold-pack, 2 to 1: that is, two pounds of fruit to one pound of sugar) for the standard chosen, shown in the following table:

Standard of mix and Ice-Cream	Quantity of Assorted cold pack (2 to 1) fruit		
	For 100-lb. mix (pounds)	For 5-gal. mix	For 100 gal. mix
6	3.654	1½ pts.	3 gals. 3½ pts.
7	3.954	1½ pts.	3 gals. 5½ pts.
8	4.254	2 pts.	4 gals. 7¾ pts.
9	4.554	2 pts.	4 gals. 1¾ pts.
10	4.854	2 pts.	4½ gals.
12	5.454	2¼ pts.	5 gals. 5¾ pts.
14	6.054	2½ pts.	6 gals. ½ pt.

Complete the freezing, hardening and packing in usual way.

Fresh fruits or fruits preserved in other ways than cold-packed, 2 to 1, may be used if first adapted as provided in the standardization tables on page 280.

OTHER NEW YORK OR NEAPOLITAN ICE-CREAMS

Any of the standard formulas on pages 124 to 192, of the chocolate and other formulas on pages 262 to 267, of the fruit formulas on pages 270 to 289, of the nut formulas on pages 293 to 299, and of the bisque formulas on pages 300 to 311, may be used in making New York or Neapolitan Ice-Cream simply by substituting a New York or Neapolitan mix of the desired standard, made as directed on pages 312 and 313, for the regular mix in the formulas.

BISQUIT TORTONI

(With Regular Vanilla Mix)

Make the quantity of a New York or Neapolitan mix of the standard desired, as follows:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.43	93.14	92.45	91.61	90.56
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts.
For 100-gal. mix	93 gals. 3½ pts.	93 gals. 1¼ pts.	92 gals. 3½ pts.	91 gals. 5 pts.	90 gals. 4½ pts.

Flavor the mix to taste with True Bitter Almond flavoring extract and a very little Carameline. Color, to suit, with Caramel Shade Brown dry color.

Put into freezer. When partly frozen, add the quantity of 30 per cent. cream for the same standard in the following table:

	Quantity of 30% Cream				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	1.54	1.83	2.52	3.36	4.41
For 5-gal. mix	¾ pt.	1 pt.	1¼ pts.	1½ pts.	2 pts.
For 100-gal. mix	1 gal. 5½ pts.	2 gals.	2¾ gals.	3 gals. 5 pts.	4 gals. 5¾ pts.

When mix is nearly frozen, add:

For 100-lb. mix.....{Almond flavored macaroons.....2.22 lbs.
Meringue ..... 2.22 lbs.

For 5-gal. mix.....{Almond flavored macaroons .....1 lb.
Meringue ..... 1 lb.

For 100-gal. mix....{Almond flavored macaroons .....20 lbs.
Meringue ..... 20 lbs.

A formula for making a suitable meringue will be found on page 383.

Break the macaroons and meringue into small pieces (not too fine) and add them through the fruit funnel while the dasher revolves. Complete the freezing and harden in usual way.

Pack Bisquit Tortoni in bricks, either individual or large for slicing, or in cases. Serve with a dusting of coarsely powdered almonds or pecans.

The appearance of Bisquit Tortoni is much improved if, when packed, the bricks or cases are first lined with red water ice (see Maraschino formula, page 363). Harden the ice well in the hardening room before adding the Tortoni. Garnish with a Maraschino cherry.

BISQUE OF MARRONS (Chestnuts)

Make a mix and add cream to it in the same manner as for a Bisquit Tortoni (see above formula), flavoring it to taste with Imitation Maraschino flavoring extract or emulsion. Color to suit with Cherry Shade Red Liquid or dry color.

Take:

For 100-lb. mix, marrons in sirup.....4.43 lbs.
For 5-gal. mix, marrons in sirup.....2 lbs.
For 100-gal. mix, marrons in sirup.....40 lbs.

Marron debris (pieces) will answer as well as the whole nuts and is cheaper.

Add the marrons, chopped medium fine, with sirup through fruit funnel when mix is nearly frozen.

This bisque should be packed and served in the same way as a Bisquit Tortoni, except that a pistachio water ice (see formula, page 364) should be used instead of a red ice for lining bricks or cases.

BISQUE OF WALNUTS, PECANS, PISTACHIO NUTS OR ALMONDS

A bisque of any one of these nuts may be made in the same way as a Bisque of Marrons (formula on opposite page), except that, for the flavoring, color and case or mold-lining named in the marron formula, there should be used:

For Walnut Bisque or Pecan Bisque, Imitation Walnut flavoring extract, Yellow Liquid Color for Ice Cream, and (for lining cases or molds) apple cider ice (formula page 345).

For Pistachio Bisque, Imitation Pistachio flavoring extract or emulsion, Pistachio Shade Green liquid or dry color, and (for lining cases or molds) either Maraschino or orange water ice (pages 363 and 364), or red currant fruit ice (page 349).

For Almond Bisque, True Bitter Almond flavoring extract; Yellow Liquid Color for Ice-Cream, and (for lining cases or molds) pistachio or maraschino water ice (page 364 and 363), or currant fruit ice (page 349) whichever may be preferred.

VIENNA ICE-CREAM

Vienna Ice-Cream, like New York or Neapolitan, contains custard; but, unlike it, the yolks, not the whole eggs, are used in making it.

FORMULAS FOR CUSTARDS
Made with Egg Yolk
for Vienna Ice-Creams

Standard of mix and of Ice-Cream (per cent. milk fat)	Ingredients	For 100-lb. mix[1] (pounds)	For 5-gallon mix	For 100-gallon mix
7	Egg yolk	0.611	7 yolks (4½ fl. oz.)	140 yolks (5¼ pts.)
	Whole milk	3.612	1½ pts.	3 gals. 6½ pts.
	Cream, 30%	1.083	½ pt.	1 gal. 1½ pts.
	Granulated sugar	0.881	6½ oz.	8 lbs.
8	Egg yolk	0.699	8 yolks (4¾ fl. oz.)	160 yolks (¾ gal.)
	Whole milk	3.362	1¼ pts.	3 gals. 4½ pts.
	Cream, 30%	1.340	¾ pt.	1 gal. 3¾ pts.
	Granulated sugar	0.885	6½ oz.	8 lbs. ½ oz.
10	Egg yolk	0.878	10 yolks (6 fl. oz.)	200 yolks (7½ pts.)
	Whole milk	3.643	1½ pts.	3 gals. 6½ pts.
	Cream, 30%	2.254	1 pt.	2 gals. 3½ pts.
	Granulated sugar	1.078	7¾ oz.	9¾ lbs.
12	Egg yolk	1.059	12 yolks (7¼ fl. oz.)	240 yolks (9 pts.)
	Whole milk	3.703	1½ pts.	3 gals. 7 pts.
	Cream, 30%	3.399	1½ pts.	3 gals. 5 pts.
	Granulated sugar	1.262	9 oz.	11 lbs. 6 oz.
14	Egg yolk	1.241	14 yolks (8½ fl. oz.)	280 yolks (10½ pts.)
	Whole milk	3.537	1¼ pts.	3 gals. 6½ pts.
	Cream, 30%	4.774	2¼ pts.	4 gals. 7½ pts.
	Granulated sugar	1.436	10¼ oz.	12 lbs. 14 oz.
Special 8% for Ala., N. J., Tenn., W. Va.	Egg yolk	0.699	8 yolks (4¾ fl. oz.)	160 yolks (¾ gal.)
	Whole milk	3.569	1½ pts.	3¾ gals.
	Cream, 30%	1.133	½ pt.	1¼ gals.
	Granulated sugar	0.885	6½ oz.	8 lbs. ½ oz.

[1]The difference between the total of these quantities and 100 pounds is the quantity of regular vanilla mix to be used. For example, the total weight of the custard ingredients for the 10 per cent. standard is 6.853 pounds, according to the above table. Deducting that from 100 pounds leaves 93.147 pounds of regular 10 per cent. vanilla mix to be added to the 6.853 pounds custard to make 100 pounds Vienna Ice-Cream of 10 per cent. standard. The 5-gallon and 100-gallon columns are used in a similar manner.

In the custard formulas opposite, all the milk fat and sugar, and most of the milk-solids-not-fat, displaced by the egg yolks, are restored. These formulas are so calculated that the small quantity of milk used in the custard may be of any standard from 3 per cent. milk fat up.

These custards will serve for all Vienna Ice-Cream of the standards named in the table and for some frozen puddings and specialties.

Directions for making are similar to the directions for whole-egg custards on page 312. For best results use fresh egg yolk.

VIENNA VANILLA ICE-CREAM

Make a Vienna custard for the desired standard, in accordance with the formula on opposite page.

Make the quantity of regular vanilla mix of the desired standard according to the following tables:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	93.813	93.714	92.147	90.577	89.012
For 5-gal. mix	4 gals. 5½ pts.	4 gals. 5½ pts.	4 gals. 4¾ pts.	4 gals. 4¼ pts.	4 gals. 3¾ pts.
For 100-gal. mix	93 gals. 6½ pts.	93 gals. 5¾ pts.	92 gals. 1¼ pts.	90 gals. 4¾ pts.	89 gals.

Color to desired shade with Yolk-em Egg Shade liquid or dry color, and put into freezer.

When mix is nearly frozen add the custard through the fruit funnel and slowly complete freezing.

VIENNA FRUIT ICE-CREAM

Vienna Fruit Ice-Cream is made in the same way as a Standard Fruit Ice-Cream, in accordance with the tables on pages 270 to 279, except that a Vienna Mix with custard added, made according to formula on opposite page, is used instead of the regular mix.

VIENNA NUT ICE-CREAM

Vienna Nut Ice-Cream is made in exactly the same way as a Standard Nut Ice-Cream, in accordance with the tables on pages 285 to 295, except that a Vienna mix with custard added, made according to formula on opposite page, is used instead of the regular mix.

OTHER VIENNA ICE-CREAMS

Any of the standard formulas on pages 124 to 192, of the chocolate and other formulas on pages 262 to 267 of the fruit formulas on pages 270 to 289, of the nut formulas on pages 293 to 299, of the bisque formulas on pages 300 to 311, and of the New York or Neapolitan formulas on pages 312 to 321, may be used in making Vienna Ice-Cream simply by substituting the same quantity of a Vienna mix of the desired standard, made as directed on page 322, for the quantity of New York or Neapolitan mix named in the formula.

FRENCH ICE-CREAM

French Ice-Cream may be described as a glorified New York or Neapolitan Ice-Cream. They differ from each other in the way in which the eggs in them are combined with the other ingredients and in the manner of freezing.

Any New York or Neapolitan Ice-Cream formula may be used in making a French Ice-Cream simply by following the directions in the following formula as to use of eggs and freezing.

FRENCH VANILLA ICE-CREAM

Take the same number or quantity of eggs as for New York or Neapolitan Ice-Cream, but separate the yolks from the whites and, using the yolks only, make a custard for the desired standard, in accordance (in all other respects) with the formula for New York or Neapolitan custard on page 312.

Make the quantity of the standard vanilla mix according to the following table:

	Quantity of regular vanilla mix				
	For 7% standard	For 8% standard	For 10% standard	For 12% standard	For 14% standard
For 100-lb. mix (pounds)	92.881	92.562	90.833	89.014	87.199
For 5-gal. mix	4 gals. 5¼ pts.	4 gals. 5 pts.	4 gals. 4¼ pts.	4 gals. 3¾ pts.	4 gals. 3 pts.
For 100-gal. mix	92 gals. 7 pts.	92 gals. 4½ pts.	90 gals. 6¾ pts.	89 gals. ¼ pt.	87 gals. 1¾ pts.

Flavor to taste with vanilla flavoring and color to suit with Yolk-Em Egg-Shade liquid or dry color.

Beat the whites of eggs until they are stiff.

Put mix in freezer. When nearly frozen add, first the custard, mixing it well with the dasher, and next the beaten whites, allowing the machine to run till all is well mixed. Then complete the freezing.

A French freezer has no dasher, and a typical French Ice-Cream made in an American freezer should have the dasher turning very slowly, making a heavy, soggy Ice-Cream, lacking the necessary air in it which the American consumer demands.

PARFAITS, MOUSSES, ETC.

Cream whipping is hastened by placing the bowl containing the cream in a basin of ice water. Flavoring and sugar should be added when the cream is partly beaten and not before.

Only a heavy cream—preferably one with 36 to 40 per cent. milk-fat—should be used in making a parfait, mousse or whip, and any sugar added (other than that mixed with fruit and thus dissolved) should be powdered sugar well sifted. If the sugar is not fine or contains lumps, pulverize it with a rolling pin on a board and then sift it.

Caterers find Heller's Snow-Drift a convenient, economical and entirely practical substitute for whipped cream, especially where good 30 to 40 per cent. whipping cream is not available. "Snow-Drift" should not be confused with "Snow," which is a stabilizer for ices and sherbets.

A parfait, mousse or whip should be frozen, not in an Ice-Cream freezer, but by filling one-quart to two-quart brick molds or melon molds and packing these in one part salt to scant three parts ice. Fill them to overflowing and, as a precaution against the possibility of salt getting into them, wrap them in wax paper.

Cases for individual service are easily procured. Generally one dozen is equal to a quart. Fill them in the same manner as a brick and put them into brick molds to freeze. They take a little longer to freeze than do the brick or melon molds, which are ready for use in from three to four hours.

PINEAPPLE MAPLE PARFAIT

(1 gallon, finished)

1 pint crushed pineapple (equal ½ of a No. 2½ can),
1 lb. sugar,
½ pint maple sirup,
8 eggs,
1 pint 40 per cent. cream,
¼ pound pecan nut meats.

Strain pineapple through fine sieve or double cloth. Add sufficient water to make one pint. Add sugar and stir until it is dissolved.

Pour an equal quantity of this liquid into each of four one-quart brick-shape or melon forms. Beat the eggs until they are light. Heat the maple sirup over water and, when it comes to a boil, slowly add the eggs and cook for four minutes, continually stirring vigorously with a beating motion. Cool. Add enough Imitation Maple flavor to develop a satisfactory maple flavor, but be careful not to put in too much: it is very powerful and economical.

If simple sirup is used instead of maple sirup, a slight increase of Imitation Maple flavor is necessary.

Whip the cream until it is very stiff. Fold it into the combination of maple sirup and eggs and add the pecan nuts broken into small pieces. Carefully pour this into molds on top of pineapple juice—one-quarter in each mold—filling them full. Cover and wrap molds, and freeze like parfaits, mousses, etc., as directed on opposite page.

A lower grade cream than 40 per cent. may be used, but in that case the quantity should be slightly increased, and it will be more difficult to beat it sufficiently stiff.

Where pecan nuts are not available, ground walnuts, hickory, or butternut meats may be used instead.

MOUSSE CAFÉ

(1 gallon, finished)

2½ quarts 40 per cent. cream,
1 pound powdered sugar,
True Coffee flavoring paste, to taste.

Sift the sugar.

Flavor cream to taste. Whip until very stiff, working in the sugar.

Fill mold, pack and freeze like parfaits, mousses, etc., as directed on opposite page.

CHANTILLY MOUSSE

(1 gallon, finished)

1 quart 40 per cent. cream,
1 lb. powdered sugar,
1½ lbs. almond macaroons.

Flavor the cream to taste with either vanilla flavoring or Imitation Violet extract, being careful not to use too much.

Beat the flavored cream until it is very stiff.

Sift the sugar and add it and finally the macaroons, crushed to very small pieces but not pulverized. Mix thoroughly.

Fill mold, pack and freeze like parfaits, mousses, etc., as directed on page 326.

If flavored with violets, garnish, when serving, with candied violets: if flavored with vanilla, use angelica stalks (candied) as a garnish. A stiff meringue, dry lady fingers or any crumbly plain cake may be used instead of macaroons, but macaroons will make the most satisfactory product.

Adding a little True Bitter Almond flavoring extract will improve the flavor.

STRAWBERRY MOUSSE

(1 gallon, frozen)

2 quarts 40 per cent. cream,
1½ pounds powdered sugar,
1 pint fresh strawberries.

Crush strawberries and press through sieve. Sprinkle with about ½ pound of sugar and allow to stand at least one hour.

Sift the rest of the sugar.

Flavor the cream to about one-half desired strength with Imitation Strawberry flavoring extract or emulsion. Then beat until stiff, working in the sifted sugar. Color to suit with Strawberry Shade Red liquid or dry color. Combine strawberries with cream.

Fill molds, pack and freeze like parfaits, mousses, etc., as directed on page 326.

When serving, top with a whole strawberry or a Maraschino cherry.

OTHER FRUIT MOUSSES

The formula for Strawberry Mousse may be used in the making of many other Fruit Mousses simply by substituting other fruits, flavoring extracts and colors.

For Peach Mousse, use 1 pint of the pulp of fresh peaches, crushed and pressed through a sieve; Imitation Peach flavoring extract or emulsion, and Navel Orange Shade Yellow color.

For Pineapple Mousse, use 1 pint (or one-half of a No. 2½ can) of crushed pineapple; Imitation Pineapple flavoring extract or emulsion, and Navel Orange Shade Yellow liquid or dry color.

For Currant Mousse, use 1 pint of red currants, crushed and pressed through a sieve; Imitation Currant flavoring extract, and Cardinal Dark Red liquid or dry color.

For Green Gage Plum Mousse, use 1 pint of green gage plums stewed in enough water to cover, cooled, drained and pressed through a sieve; or one-half of a No. 2½ can of green gage plums, drained free of sirup and pressed through a sieve; Imitation Plum flavoring extract and Lemon Shade Yellow liquid or dry color.

For Malaga Grape Mousse, use 1 pound malaga grapes crushed and pressed through a sieve, and Lemon Shade Yellow liquid or dry color.

For a Grape Mousse, use 1 pound of Concord or any other dark full flavored grape, crushed and pressed through a sieve. Imitation Grape flavoring extract or emulsion; Riverside Violet Shade liquid color.

For Cherry Mousse, 1 pound fresh ripe cherries, pitted and chopped very fine; Imitation Cherry flavoring extract or emulsion and Cherry Shade Red liquid or dry color.

For Pear Mousse, 4 large ripe Bartlett pears, peeled and pressed through a sieve; Imitation Pear flavoring extract, and Navel Orange Shade Yellow liquid or dry color.

For Currant-Raspberry Mousse, ½ pint currants and ½ pint red raspberries, crushed and pressed through a sieve; Imitation Raspberry flavoring extract or emulsion, and Raspberry Shade liquid or dry red color.

For Apricot Mousse, use 1 pint of the pulp of fresh apricots, crushed and pressed through a sieve; Imitation Apricot flavoring extract, and Navel Orange Shade liquid or dry color.

For Raspberry Mousse, use 1 pint fresh raspberries, crushed and pressed through a sieve, Imitation Raspberry flavoring extract or emulsion, and Raspberry Shade Red liquid or dry color.

For Blackberry Mousse, use 1 pint fresh blackberries, crushed and pressed through a sieve; Imitation Blackberry flavoring extract or emulsion, and Heliotrope liquid color.

In any of these Fruit Mousses, cold pack fruit, 2 to 1, may be used by increasing the quantity of fruit one-half and reducing the quantity of powdered sugar used, to the one pound added to the cream.

For method of substituting fruits preserved in other ways for 2-to-1 cold pack fruit, see table on page 280.

A mousse should be made attractive by garnishing it when serving, either with a berry of the kind which flavors it, if it be a Berry Mousse, or with a cube of colored citron or a maraschino cherry.

FROZEN ORANGE WHIP

(1 gallon, finished)

2 lbs. granulated sugar,
¾ pint water,
1½ dozen large oranges,
2 pints 40 per cent. cream.

Peel oranges, carefully removing all the inner white skin and seeds. Squeeze the juice from 10 oranges. Cut the remaining 8 oranges in half crosswise and take out pulp in small pieces, saving any juice that may leak out and adding it to the juice of the 10 oranges.

Boil sugar and water to 238 degrees F. or until it spins a thread. Cool. Flavor well with True Orange flavoring extract or emulsion and add ½ pint of orange juice. Keep in warm place one hour.

Beat cream until very stiff, and fold it into orange flavored sugar sirup.

Pour rest of orange juice in equal portions into four one-quart molds. Add to each a thin layer of cream, putting it in carefully so that it will float on orange juice.

Then fill molds to overflowing with alternate layers of orange pulp and cream.

Cover. Wrap in wax paper. Pack in equal parts of crushed ice and rock salt. Will be ready for use in about three hours.

FROZEN CUSTARDS, PUDDINGS, BISQUIT AND BOMB GLACÉ, ETC.

Custards and puddings are a very rich, highly flavored form of Ice-Cream for which a New York or Neapolitan Mix is generally the basis.

Bisquit Glacé is a special Ice-Cream—an aristocrat among Ice-Creams—the mix for which differs radically from the mix for any other Ice-Cream, except Bomb Glacé which is kindred to it. Bisquits Glacé should be distinguished from bisques, often called bisquits, which they resemble only in having macaroons, crisp cake, confections, and other such materials added to them.

In the formulas which follow no attempt has been made to restore the milk solids displaced by the addition of fruit, nuts, cake, etc., as these products are usually sold under their distinctive name and, therefore, do not come under laws and regulations governing Ice-Cream standards.

FROZEN CUSTARD

Make a custard for a 14 per cent. milk-fat standard according to the formula for New York or Neapolitan custard on pages 312 and 313.

Add to it regular vanilla mix of the standard available:

For 100-lb. mix ..... 77.119 lbs.
For 5-gal. mix ..... 3 gals. 7 pts.
For 100-gal. mix ..... 77 gals. 1¾ pts.

Flavor well with vanilla flavoring and color to suit with Yolk-Em-Egg Shade color.

Put into freezer and when nearly frozen, while dasher revolves, add through fruit funnel the following quantity of 30 per cent. cream:

For 100-lb. mix ..... 10 lbs.
For 5-gal. mix ..... ½ gal.
For 100-gal. mix ..... 10 gals.

Complete the freezing, hardening and packing in usual way.

True Lemon extract or emulsion, or any other flavor desired may be used instead of vanilla flavoring. Vanilla or lemon are generally preferred.

GRANDMOTHER STYLE CUSTARD

(1 gallon mix)

Make an 8-egg custard in accordance with the formula on page 313.

Cool it and add 4½ pints of 30 per cent. cream and 1 lb. 2 oz. of granulated sugar. Put in ice box.

Take:

Candied citron, chopped fine ..... 2 oz.
Seeded raisins ..... 3 oz.
Washed currants ..... 2½ oz.
Almonds, roasted and chopped ..... 2 oz.

Pour Imitation Rum flavoring extract or Imitation Brandy flavoring extract liberally over the fruit and nuts and allow it to soak in over night.

Put custard with added cream and sugar into freezer. When partly frozen, while dasher revolves, add fruit and nuts through fruit funnel. Complete the freezing, hardening and packing in usual way.

MANHATTAN PUDDING

Make a New York or Neapolitan Ice-Cream mix of any desired standard (see formula page 312):

For 100-lb. mix ..... 74.753 lbs.
For 5-gal. mix ..... 3¾ gals.
For 100-gal. mix ..... 74¾ gals.

Flavor with Imitation Maraschino flavoring extract or emulsion. Color with Cherry Shade Red liquid or dry color.

Take:

	For 100-lb. mix	For 5-gal mix	For 100-gal. mix
Orange juice	9.269 lbs.	2 qts.	10 gals.
Lemon juice	2.328 lbs.	1 qt.	2½ gals.
English walnut meats	4.43 lbs.	2 lbs.	40 lbs.
Pecan meats	4.43 lbs.	2 lbs.	40 lbs.
Assorted fruits	4.43 lbs.	2 lbs.	40 lbs.

The fruit should be candied pineapple, cherries, citron, orange strings, (candied strips of orange peel) angelica stalks, etc., and it should be cut into small cubes or pieces. Break the nut meats into small pieces.

Freeze the mix in usual way, adding fruit and nuts through fruit funnel shortly before drawing.

Serve with Jelly sauce (see formula, page 386) or Nesselrode Sauce (formula, page 387), and garnish with a cube of citron or green colored pineapple.

NESSELRODE PUDDING, No. 1

Named in honor of Karl Robert Nesselrode, chancellor of the Russian empire, who lived 1780-1862.

Make a New York or Neapolitan Vanilla Mix (see formula, page 312)

For 100-lb. mix.....82.288 lbs.
For 5-gal. mix.....4 gals. 1 pt.
For 100-gal. mix.....83 gals. 2½ pts.

Take:

For 100-lb. mix.... { 11.07 lbs. marrons debris (crushed chestnuts), 6.642 lbs. maraschino cherries,

For 5-gal. mix..... { 5 lbs. marrons debris, 3 lbs. maraschino cherries,

For 100-gal. mix.. { 100 lbs. marrons debris, 60 lbs. maraschino cherries.

Chop marrons debris, not too fine. Quarter the maraschino cherries. Mix these in the sirup from the marrons.

Put New York or Neapolitan mix into freezer, and when it is nearly frozen, while paddles are revolving, add the marron and cherry mixture through fruit funnel, and then sufficient Imitation Brandy flavor to give the pudding the desired zest.

Continue freezing, and harden and pack in the usual way.

NESSELRODE PUDDING, No. 2

Make a New York or Neapolitan Vanilla mix (see formula, page 312).

For 100-lb. mix.....83.373 lbs.
For 5-gal. mix.....4 gals. 1½ pts.
For 100-gal. mix.....83 gals. 3 pts.

Take:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Candied cherries	4.43 lbs.	2 lbs.	40 lbs.
Seeded or seedless raisins	4.43 lbs.	2 lbs.	40 lbs.
Candied citron	1.107 lbs.	½ lb.	10 lbs.
Walnut meats	2.22 lbs.	1 lb.	20 lbs.
Shelled almonds	2.22 lbs.	1 lb.	20 lbs.
Shelled filberts or hazelnuts	2.22 lbs.	1 lb.	20 lbs.

Blanch almonds and filberts (or hazelnuts) as directed on page 94. Cut candied cherries into quarters. Chop other fruit and nuts, but not too finely.

Flavor the New York or Neapolitan mix to taste with a little Bitter Almond flavoring extract, and put into freezer. When mix is nearly frozen add fruit and nuts. Continue the freezing, and harden and pack in usual way.

Serve with Nesselrode Sauce (see formula, page 387). The pudding may be garnished with one or two maraschino cherries, and the sauce should be served separately.

PLUM PUDDING, No. 1

Make a New York or Neapolitan Vanilla mix (see formula, page 313).

For 100-lb. mix.....95.57 lbs.
For 5-gal. mix.....4 gals. 6¼ pts.
For 100-gal. mix.....95 gals. 4½ pts.

Color it with maple shade brown dry color.

Take:

For 100-lb. mix....{Raisins, 4.43 lbs. / Currants, 2.22 lbs. / Lady fingers or meringue, 2.22 lbs.

For 5-gal. mix.....{Raisins, 2 lbs. / Currants, 1 lb. / Lady fingers or meringue, 1 lb.

For 100-gal. mix..{Raisins, 40 lbs. / Currants, 20 lbs. / Lady fingers or meringue, 20 lbs.

The currants should be well cleaned. Use any good cooking raisins (do not use sultanas). The meringue should be one that is dry and crumbles easily, such as that made according to formula on page 384.

Soak raisins and currants over night in Imitation Brandy flavor. Break up lady fingers or meringue.

Put mix into freezer, and when it is nearly frozen add fruit and cake through fruit funnel while dasher is revolving.

Continue the freezing, hardening and packing in usual way.

This pudding should be served with Nesselrode Sauce (made according to formula on page 387) in separate container.

PLUM PUDDING, No. 2

Make a New York or Neapolitan Vannilla mix of any desired standard (see formula, page 313):

or 100-lb. mix.....77.66 lbs.
For 5-gal. mix.....3 gals. 7 pts.
For 100-gal. mix.....77 gals. 5¼ pts.

Make a chocolate sirup in accordance with the formula on page 259:

For 100-lb. mix.....11.25 lbs.
For 5-gal. mix.....4 pts.
For 100-gal. mix.....9 gals. 6½ pts.

Add the chocolate sirup to the New York or Neapolitan mix. Take:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Assorted fruits	4.42 lbs.	2 lbs.	40 lbs.
Raisins	2.22 lbs.	1 lb.	20 lbs.
Figs, dried	2.22 lbs.	1 lb.	20 lbs.
Walnut meats	2.22 lbs.	1 lb.	20 lbs.

The assorted fruits may be any candied or fresh fruit available or any canned fruits drained of sirup.

The figs should be chopped quite fine. If very dry before chopping, stew them in sweetened water until soft.

Chop walnuts, but not too fine.

Flavor mix to taste with True Cassia (Cinnamon) flavoring extract and True Clove flavoring extract or emulsion.

Put into freezer. When nearly frozen, while dasher is revolving, add the fruit and nuts through fruit funnel. Complete the freezing, hardening and packing in usual way.

FROZEN TAPIOCA PUDDING

(5-gallon mix)

2 pints pearl tapioca,
4 gallons whole milk,
2 pounds sugar,
1 to 2 teaspoonfuls salt,
32 eggs,
3¼ pints cream, 30 per cent,
Vanilla flavoring, to suit.

Minute tapioca may be used instead of pearl tapioca, in which case use only 1½ pints of the tapioca and increase the quantity of milk used by ½ pint.

Soak tapioca one hour. Add milk and cook until tapioca is transparent.

Separate yolks of eggs from whites and beat the yolks to a froth.

Add sugar, salt and beaten egg yolks to tapioca and milk. Cook slowly.

Take mix from fire and add vanilla flavoring.

Beat the whites of eggs. Fold them into mix. Cool, and put into freezer.

Whip cream until it is stiff.

When pudding is nearly frozen, add whipped cream to it and continue freezing.

BAVAROISE OR BAVARIAN CREAM

(1-gallon mix)

3½ pints milk,
2 pounds powdered sugar,
25 whole eggs,
¼ pound butter,
3 pints 30 per cent cream,
½ ounce gelatin.

Scald the milk. Add to it the yolks of the eggs, well beaten, and the sugar. Put into double boiler and cook until it coats a spoon. Stir in the butter and remove from fire. Strain and beat till cool. Then flavor to taste with vanilla extract and color with Yolk-Em Egg Shade dry color. Fold in egg whites well beaten.

Put into freezer. When partly frozen, add cream whipped stiff, and complete freezing. Harden and pack as usual.

BODY FOR BISQUIT GLACÉ

Make a custard as follows. Take:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Egg yolks	3.157 lbs.	35 yolks (1 pt. 5¼ oz.)	700 yolks (3 gals. 2½ pts.)
Granulated sugar	2.841 lbs.	1¼ lbs.	25 lbs.
Water	5.91 lbs.	2½ pts.	6¼ gals.

Mix well. Heat in steam-jacket kettle or over water until it begins to steam. Do not allow it to cook. Remove from fire and at once set container in ice and water. Beat continuously while it cools until the mixture becomes very stiff.

Take of good whipping cream (not less than 23 per cent milk fat and preferably 30 to 40 per cent milk fat):

For 100-lb. mix.....79.574 lbs. whipping cream,
For 5-gal. mix.....4 gals. 1¾ pts. whipping cream,
For 100-gal. mix.....83¾ gals. whipping cream.

Whip this mixture. When it begins to stiffen, continue beating while flavoring to taste and slowly adding powdered sugar as follows:

For 100-lb. mix.....8.518 lbs. powdered sugar,
For 5-gal. mix.....3¾ lbs. powdered sugar,
For 100-gal. mix.....75 lbs. powdered sugar.

Granulated sugar may be used, but powdered sugar makes a finer and better glacé.

Continue whipping cream until it is as stiff as it can be made.

Then fold the egg-yolk mixture into the cream and it will be ready for such further additions as may be desired.

The vessel containing the cream while it is being whipped and while egg-yolk mixture is being added should be in a kettle or pan of water and ice to bring its temperature down to or below 45 degrees F. If not frozen at once it must be put where it will not go above 45 degrees F., as if it does it will become mushy and be unfit for the desired use.

Freeze in usual way, but not too hard.

A glacé Ice-Cream is so delicate that containers into which it is packed—bricks, melon molds or individual cases—should be lined with a water ice of a color that will either contrast or blend well with the color and flavor of the bisquit glacé.

For red ice use cherry fruit ice (formulas pages 347 and 348), raspberry fruit ice (formulas page 356), or currant fruit ice (formula page 349). For green ice use pistachio water ice (formula, page 364), a green plum fruit ice with Lemon Shade Yellow color (formula, page 355), or a green grape fruit ice with Lemon Shade Yellow color (formula, page 350). For a yellow ice use orange fruit ice (formula, page 353), orange water ice (formula, page 364), lemon water ice (formula, pages 361-362), or lemon fruit ice (formula, page 351).

To line the brick or case, first cool it well by placing in hardening room or covering with waxed paper and packing in ice-and-salt mixture. Then line bottom and sides with a coating of the ice selected, at least one-quarter inch thick, smoothing it with the back of a teaspoon or with a knife or spatula. Return to hardening room or ice-and-salt pack and keep there till lining is hard. Then fill, line the cover with ice, and put it on. Cover brick with waxed paper, and pack in freezing mixture of equal parts of crushed ice and salt. Will freeze ready for use in four hours.

BISQUIT TORTONI

(With Bisquit Glacé Mix)

Make a body glacé mix, flavored to taste with True Bitter Almond extract and a very little Carameline, and color to suit with Caramel Shade Brown dry color, in accordance with the formula on opposite page. Following are the quantities:

For 100-lb. mix.....95.56 lbs.
For 5-gal. mix.....4 gals. 4¼ pts.
For 100-gal. mix.....95 gals. 4½ pts.

Put in freezer and when nearly frozen, while dasher revolves, add through the fruit funnel:

For 100-lb. mix.....{Macaroons, 2.22 lbs. / Meringue, 2.22 lbs.

For 5-gal. mix.....{Macaroons, 1 lb. / Meringue, 1 lb.

For 100-gal. mix.....{Macaroons, 20 lbs. / Meringue, 20 lbs.

The macaroons should be almond flavored. The meringue may be made according to the formula on page 383. Both macaroons and meringue should be dry and crushed or broken into small pieces.

Finish freezing and pack as directed on preceding page.

When serving Bisquit Tortoni dust with a coarse powder of almonds or pecans.

BISQUIT AU MARRON

Make a body glacé mix as for Bisquit Tortoni (on preceding page), but flavored with vanilla flavoring instead of almond, and colored with Yellow Liquid Color for Ice-Cream or Yolk-Em Egg Shade liquid or dry color, as preferred.

Put into freezer or when nearly frozen, while dasher revolves, add through fruit funnel the following quantity of roasted, blanched and ground chestnuts (see directions for blanching, page 94):

For 100-lb. mix.....4.44 lbs.
For 5-gal. mix..... 2 lbs.
For 100-gal. mix.....20 lbs.

Or if preferred, instead of roasted chestnuts, the following quantity of preserved marrons (chestnuts) with the sirup, may be used:

For 100-lb. mix.....4.44 lbs.
For 5-gal. mix.....1 pt.
For 100-gal. mix.....2½ gals.

Finish freezing and pack as directed on preceding page.
When serving, dust with a coarse powder of ground meringue. (For formula for meringue, see page 383.)

BISQUIT AUX ALMOND

Make a body glacé mix as for Bisquit Tortoni (on preceding page).
Put into freezer and when nearly frozen, while dasher revolves, add the following quantity either of coarsely powdered almonds or of a good almond paste:

For 100-lb. mix.....4.44 lbs.
For 5-gal. mix.....2 lbs.
For 100-gal. mix.....20 lbs.

Finish freezing and pack as directed on preceding page.
When serving, dust with a coarse powder of almonds.

BISQUIT AU PECAN

Make the same as Bisquit au Marron, adding ground pecan meats instead of chestnuts, and dusting, when serving, with a powder of pecan meats.

Bisquit au Hickory, Hazlenut, Pistachio, "English" Walnut, Black Walnut, and Brazil Nut—are made in the same way, using the nut selected (first ground, of course) instead of chestnuts, both in the Ice-Cream and as a dressing.

The Pistachio Bisquit Glacé should be flavored with Imitation Pistachio flavoring extract or emulsion and colored with Pistachio Shade Green liquid or dry color.

Bisquit au Walnut ("English") should be flavored with Imitation Walnut flavoring extract.

VANILLA BISQUIT

This is a body glacé mix made according to formula on page 336, flavored with vanilla and colored with Yellow Liquid Color for Ice-Cream.

Many other flavored bisquits, without solid additions, may be made in the same way by using the appropriate flavoring and coloring. The following list suggests a few of the many:

Bisquit au Maraschin—Flavor with Imitation Maraschino flavoring extract or emulsion and color with Cherry Shade Red liquid or dry color.

Bisquit au Kirsch—Flavor with cherry juice and color with Cherry Shade Red liquid or dry color.

Bisquit au Cognac—Flavor with Imitation Brandy flavoring extract and color slightly with Caramel Shade Brown dry color.

Bisquit au Rum—Flavor with Imitation Brandy flavoring extract and color slightly with Caramel Shade Brown dry color.

Bisquit au Champagne—Flavor with Imitation Champagne flavoring extract and color with Yellow Liquid Color for Ice-Cream.

Bisquit au Creme de Menthe—Flavor delicately with True Peppermint flavoring extract and color lightly with Creme de Menthe Shade Green liquid or dry color.

Bisquit au Violet—Flavor with Imitation Violet flavoring extract and color lightly with Riverside Violet dry color.

Bisquit au Rose—Flavor with Imitation Rose flavoring extract and color with Brilliant Rose Shade Pink dry color.

BOMB GLACE

(To Make 1 Gallon)

Whites of 10 eggs (or ½ pint egg white),
Powdered sugar, 1¼ pounds,
Cream, 30 per cent (or heavier), 3½ pints.

Whip cream until it is stiff.

Sift sugar. Beat the egg whites (which must be fresh) until stiff, adding enough sugar to hold them up, and no more.

Boil remainder of sugar until it forms a thread (228 degrees F.). Cool and, when lukewarm, fold in the beaten egg whites.

Add the whipped cream in proportion of about two parts of whipped cream to one part of the egg-white-sugar combination, and flavor as desired.

Put into molds—either brick, melon or bomb (made especially for this use) or into individual cases. The molds should be lined with a water-ice, a fruit-ice or plain Ice-Cream, as for Bisquit Glacé (see directions, page 337). The cases should be packed in a mold.

Cover mold with wax paper, and pack in freezing mixture of equal parts of crushed ice and salt. Will freeze ready for use in four hours.

Bomb Glacé may be used instead of Bisquit Glacé in all cases in which formulas direct the use of Bisquit Glacé. (See formulas, pages 336 to 339.)

ICES, SHERBETS, ETC.

Ices and sherbets or sorbets are of Oriental origin. "Sherbet" is the Turkish form of the Arabic "sharbat," derived from "shariba," meaning "to drink."

They have contributed to the pleasure of mankind for so long a time that the date of their beginning is lost in antiquity.

Alexander the Great, immediately after his conquest of Egypt, 345 B. C., caused fifteen trenches to be dug and filled with snow that he might have the means of gratifying his taste for sherbets. Sir Edwin Arnold pictures Buddha (about 500 B. C.) "drinking" sherbets "cooled with snows from Himalay." All through the histories and literature of days now long past, we find references to sherbets, sorbets and zerbets whenever India, Turkey, or the land of the Fire Worshipers, Persia, is mentioned.

In Turkey, India and Asiatic countries generally a sherbet is a beverage consisting of fruit juices diluted with water, dropped upon a cake of sugar and partly frozen with snow. The ices and sherbets of America are very similar, though much improved and of many varieties that would seem strange to the Turk and Arab.

These include fruit ices, water ices, granites, sherbets, sorbets, frappés, soufflés and punches.

These will be defined and treated in the order named.

Sherbets, Fruit-Ices, Water-Ices, etc., are of such a nature, that they allow the manufacturer a great deal of leeway in cost: that is, they can

be made of the kind of materials, and in such a way, that they prove to be far more expensive than the very finest grades of Ice-Cream, or they can be made more economically. If the manufacturer of sherbets wants a finished product that is out of the ordinary, he will very often add such ingredients as egg whites in large quantities, high grade cream, excessive amounts of expensive fruits and flavors, and aside from this he will add to the cost of manufacture by treating many of the items separately before combining them into one mix. He will whip the egg whites at one time, the cream at another, and after making a mixture of both of these, they will be added to the balance of the mix to make a soufflé. Other methods are also used but, when producing elaborate sherbets, water ices, etc., in this manner, the price must, necessarily, be very high.

In this book, we aim to show only the kind of formulas for sherbets, water ice, etc., which can be commonly used and which are most economical. An exception is the fruit ice known as Macedone of Fruit. The formulas for the more elaborate sherbets are given under the name of "Sorbets" and "Soufflés" and as "Royal Punch," under the head of "Punches." Any ice-cream manufacturer who desires to produce a fancy commercial Ice or Sherbet under another name can easily do so by additions of various items, and by using any special methods he might choose in the way of processing the separate ingredients. The water-ice and sherbet formulas shown by us are the more common ones which are used more or less for economy.

CORRECT SUGAR PROPORTIONS IN SHERBETS AND ICES

A much larger percentage of sugar is used in ices and sherbets than in Ice-Cream, both because the nature of the mix makes it necessary for flavoring purposes and because it helps to supply in part the required solids.

In the following formulas the quantity of sugar required has been determined as accurately as possible by a consideration of the various governing factors, including the acidity, sugar requirements, etc., of any fruit added as shown in the table on page 92. The acidity of a fruit, however, is not a constant: it varies with the seasons, with climatic and weather conditions, with the extent and kind of cultivation. Sometimes, notwithstanding the care that has been exercised in preparing the formulas for ices and sherbets, the quantity of sugar prescribed may not, under temporary or local conditions, be in perfect accord with the acidity of the fruit used. In such cases, the use of a saccharometer may avoid difficulty in freezing and insure satisfactory flavor. A saccharometer is a measure of density of sugar solutions, based on the weight of the sugar in solution. It indicates the percentage of saturation. The best density, for freezing, of sugar sirup unmodified by fruit additions is 19 degrees Baumé. A Baumé hydrometer is a measure of density, based on the weight of material in solution. If a fruit, as for instance lemon, is very acid, a greater density is necessary; if it is mild, as for example banana,

the hydrometer may register 18 degrees. The permissible range is from 18 to 22 degrees Baumé.

The following table shows the degrees Baumé the saccharometer should register for the fruits most used in sherbets and ices:

Density of Completed Fruit-Ice Mix, for Freezing

Fruit	Baumé degree	Fruit	Baumé degree
Apple (sour)	18	Orange	20
Apricot	22	Peach	19
Cherry	20	Pineapple	22
Currants	22	Plum	19
Grapes	20	Raspberry	18
Lemon	21	Strawberry	19

Where the reading is less than the figure given for a fruit used, add sugar, stirring it into mix and dissolve it, until the saccharometer shows the desired degree of density. Where the reading is above the figure given, add and stir in sufficient water to lower the reading to the right figure.

FRUIT ICES

A fruit ice is fruit juice or fruit pulp and juice, diluted with water, sweetened and frozen as is Ice-Cream, but at a lower temperature.

Improve the flavor by supplementing the fruit juice and pulp with Zanzibar-Brand Flavoring Extract or Heller's Flavoring Emulsion, and adding citric acid crystals. These Fruit Flavoring Extracts and Emulsions are of superior quality and specially adapted to the ingredients given in the formulas. They are actually intensified in freezing ices and sherbets, and are therefore most economical in use.

Correct and attractive color makes food products appetizing and more salable. Malaboza Pure Food Colors of the shade indicated in each formula should, therefore, be used in every instance.

GENERAL DIRECTIONS FOR MAKING FRUIT ICES

First—Put sugar, then "Snow" and citric acid crystals, into crock, glass-lined tank, or other nonmetallic vessel and mix thoroughly.

Second—When well mixed, add water slowly, stirring until mixture becomes as thick as a heavy cream.

Third—Add fruit and fruit juice, flavoring extract or emulsion, and color, and then enough water to make 5 gallons in all, stirring until well mixed.

Fourth—Freeze in the same manner as Ice-Cream, but with a brine temperature about eight degrees lower and taking fully a third to a half longer to freeze.

Fifth—The overrun must be rigidly controlled for commercial ices. Except for immediate use on special or private orders, it is inviting complaints to obtain more than 20 per cent swell. Therefore, reduce the speed of the freezer and fill freezer about three-fourths full. "Snow" makes transportation possible and prevents the precipitation of color and sugar. "Snow" makes ices smooth and uniform from top to bottom. It serves a purpose in ices that gelatin and Meloine serve in Ice-Creams. It gives body and stability which are so lacking without it.

Sixth—Draw off soft into pre-cooled, paper-lined cans and put into hardening room or pack immediately, using a sufficiently larger proportion of salt with the ice to lower the temperature about eight degrees below that required for Ice-Cream.

Metal cans may be used for mixing fruit ices only where the mixture is to be removed without delay, as the fruit acid is likely to act on the metal and cause it to impart a metallic flavor. Glass-lined or earthenware containers are better for this mixing. The normal time in the freezer is not enough to form a danger.

Paper liners are used in cans in which ices or sherbets are packed unless they are well tinned.

For power mixer. Increase quantities of ingredients given in formula in proportion to the size of mix desired. Put sugar, "Snow" and citric acid crystals into mixer and let them mix about one minute. Then slowly, while mixer is running, pour in water until the mixture has become as thick as a heavy cream. Next add fruit, fruit juices, flavoring extract or emulsion, color, and finally, water.

APPLE FRUIT ICE

(5-gallon mix)

A good Ice to serve with pork.

4 quarts tart apples,
15½ lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Apple flavoring extract, to taste,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

Core the apples, slice, stew, in water just sufficient to cover, until tender (about 5 minutes). Press through sieve.

The color should not be more than a faint suggestion of apple cider. If green is preferred, use Creme-de-Menthe Shade Green liquid or dry color, to suit.

In other respects, follow directions on opposite page.

APPLE CIDER ICE

(5-gallon mix)

A tasty, refreshing ice.

4 quarts apple cider,
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Apple flavoring extract, to taste,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

If carbonated cider is used, cool the bottles first and pour directly from bottles through fruit funnel into mix, in order to incorporate the carbonic acid gas with it. Any added water must then be pre-cooled before it comes in contact with the carbonated cider.

Follow directions on opposite page.

BANANA FRUIT ICE

(5-gallon mix)

1 dozen fully ripe yellow bananas
15 lbs. granulated sugar
1 to 2 ounces "Snow",
3 ounces citric acid crystals
Banana flavoring extract or emulsion, to taste
Banana Shade Yellow dry or liquid color, to suit
Water to make 5 gallons

Peel and crush bananas and press through a sieve.

In other respects, follow directions on pages 344-345.

BLUEBERRY FRUIT ICE, No. 1

(5-gallon mix)

A flavorous novelty.
5 quarts cold-pack blueberries (2 to 1)[1]
14 lbs. granulated sugar
1 to 2 ounces "Snow",
1 ounce citric acid crystals
Riverside Violet dry color, to suit
Water to make 5 gallons

Follow directions on pages 344-345.

BLUEBERRY FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh blueberries
16 lbs. granulated sugar
1 to 2 ounces "Snow",
1 ounce citric acid crystals
Riverside Violet dry color, to suit
Water to make 5 gallons

Crush berries and strain through a sieve or double cloth.

In other respects, follow directions on pages 344-345.

[1]For method of adapting cherries preserved in other ways for use in this formula, see page 280.

BLACKBERRY FRUIT ICE, No. 1

5 quarts cold pack blackberries (2 to 1)[1],
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Blackberry Flavoring extract or emulsion, to taste,
Heliotrope dry color to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

BLACKBERRY FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh, ripe blackberries,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Blackberry Flavoring extract or emulsion, to taste,
Heliotrope dry color to suit,
Water to make 5 gallons.

Crush blackberries and strain through sieve or double cloth.

In other respects, follow directions on pages 344-345.

CHERRY FRUIT ICE, No. 1

(5-gallon mix)

4 quarts cold-pack sour cherries (2 to 1)[2],
15¼ lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Cherry flavoring extract or emulsion, to taste,
Cherry Shade Red, dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

[1]For method of adapting blackberries preserved in other ways for use in this formula, see page 280.

[2]For method of adapting cherries preserved in other ways for use in this formula, see page 280.

CHERRY FRUIT ICE, No. 2

(5-gallon mix)

3 qts. fresh, ripe, sour, pitted cherries,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Cherry flavoring extract or emulsion, to taste,
Cherry Shade Red, dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

CRANBERRY FRUIT ICE

(5-gallon mix)

Fine for use with roast turkey.

4 qts. (or lbs.) cranberries,
17½ lbs. granulated sugar,
1 to 2 ounces "Snow",
3 ounces citric acid crystals,
Cherry Shade Red, dry or liquid color, to suit,
Water to make 5 gallons.

Cook cranberries in sufficient water to cover them until soft; then strain through a sieve or double cloth. In other respects, follow directions on pages 344-345.

CUCUMBER FRUIT ICE

(5-gallon mix)

A delicately flavored ice to accompany or follow a meat course at dinner.

8 large cucumbers,
4 tart apples,
12 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Creme de Menthe Shade Green, dry or liquid color, to suit,
Water to make 5 gallons.

Peel cucumbers and cut in small pieces. Core apples and bake in oven until quite soft. Strain cucumbers through double cloth or sieve and press apples through sieve.

In other respects, follow directions on pages 344-345.

RED CURRANT FRUIT ICE

(5-gallon mix)

Fine for service with venison.

2 quarts fresh, red currants,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
1 ounce citric acid crystals,
Currant flavoring extract, to taste,
Cardinal Dark Red dry or liquid color, to suit,
Water to make 5 gallons.

Crush currants and strain through sieve or double cloth.
In other respects, follow directions on pages 344-345.

ELDER-PEACH FRUIT ICE

(5-gallon mix)

2 quarts elderberry juice
3 quarts cold-pack peaches (2 to 1)[1]
14 lbs. granulated sugar
1 to 2 ounces "Snow",
1 ounce citric acid crystals
Peach and True Bitter Almond flavoring extracts or emulsions, to taste. Use only a small quantity of the bitter almond flavoring.
Riverside Violet Shade, dry or liquid color, to suit
Water to make 5 gallons

Crush the peaches and strain through sieve or cloth.
In other respects, follow directions on pages 344-345.

GINGER ICE

(5-gallon mix)

4 lbs. preserved or crystallized ginger.
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Caramel Shade Brown liquid color, to suit,
Water to make 5 gallons.

Chop ginger fine in wooden chopping bowl, and when ice is partly frozen, while paddles are revolving, add slowly through the fruit funnel.

In other respects, follow directions on pages 344-345.

[1]For method of adapting other preserved peaches to use in this formula, see page 280. Two quarts fresh ripe peaches may be substituted for the cold-pack peaches, in which case the quantity of sugar added should be increased to 15½ lbs.

GOOSEBERRY FRUIT ICE

(5-gallon mix)

4 quarts fresh gooseberries,
6 lemons,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Clover Leaf Shade Green dry or liquid color, to suit,
Water to make 5 gallons.

Peel and seed lemons, being careful to remove all the white inner skin. Squeeze. Cook gooseberries, with the lemon juice, about one pound of sugar and enough water to cover, until the mixture is a semi-liquid sauce. Cool and strain through sieve or double cloth.

In other respects, follow directions on pages 344-345.

GRAPE ICE (FRUIT)

(5-gallon mix)

4 quarts grape juice,
17½ lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Grape flavoring extract or emulsion, to taste,
Riverside Violet Shade or Lemon Shade Yellow color (whichever corresponds to color of grape juice used) to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

GRAPEFRUIT OR POMELO FRUIT ICE

(5-gallon mix)

1 doz. medium size ripe grapefruit,
1 doz. large oranges,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Peel and seed grapefruit and oranges, carefully removing all of the white inner skin. Squeeze out juice and pulp.

In other respects, follow directions on pages 344-345.

LEMON FRUIT ICE, No. 1

(5-gallon mix)

2 doz. large lemons,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Lemon flavoring extract or emulsion. to taste,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Peel and seed lemons, carefully removing all of the white inner skin. Press out juice and pulp.

In other respects, follow directions on pages 344-345.

If lemons are not juicy or if a richer ice is desired, increase number of lemons. The flavor may be still further improved by adding the juice of six large oranges.

LEMON FRUIT ICE, No. 2

(5-gallon mix)

5 quarts cold-pack lemon juice (packed 5 lbs. of sugar to each gallon of juice)[1],
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Lemon flavoring extract or emulsion, to taste,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

LIME FRUIT ICE

(5-gallon mix)

4 doz. limes,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Lime flavoring extract or emulsion to taste,
Lemon Shade Yellow and Creme de Menthe Shade Green, dry or liquid color, in proportion of 20 parts to 1, to suit,
Water to make 5 gallons.

Peel and seed limes, press out and strain juice and pulp.

In other respects, follow directions on pages 344-345.

[1]This is the proportion in the cold-pack lemon juice most generally used and easily obtainable. It contains 36¾ per cent. sugar by weight. If a juice with other proportion of sugar is used, the quantity of sugar in the mix should be varied accordingly.

LOGANBERRY FRUIT ICE, No. 1

(5-gallon mix)

4 quarts cold-pack loganberries (2 to 1)[1],
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Heliotrope Shade liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

LOGANBERRY FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh loganberries,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Heliotrope Shade dry or liquid color, to suit,
Water to make 5 gallons.

Crush berries, and strain through sieve or double cloth.

In other respects, follow directions on pages 344-345.

MACEDONE OF FRUIT

(5-gallon mix)

Named for Macedonia, the home of Alexander the Great, who, it is said, invented this Fruit Ice.

4 quarts assorted candied fruits,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
Whites of 20 eggs,
Water to make 5 gallons.

Select at least 4 kinds of candied fruit or, if they are not available, take equal quantities of red and white crystallized pineapple, angelica stalks and candied citron; cut fruit into cubes, and defer adding it to the mix until it is nearly frozen. After adding it, add also the whites of the eggs beaten until stiff. In other respects follow directions on pages 344-345.

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[1]For method of adapting loganberries preserved in other ways for use in this formula, see page 280.

ORANGE FRUIT ICE, No. 1

(5-gallon mix)

2 doz. large oranges[1],
1 doz. lemons,
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Orange flavoring extract or emulsion, to taste,
Navel Orange Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Peel and seed the oranges and lemons, carefully removing all of the white inner skin. Press out juice and pulp.

In other respects, follow directions on pages 344-345.

ORANGE FRUIT ICE, No. 2 (Mandarin)

(5-gallon mix)

Make according to the foregoing formula, using 3 dozen mandarin oranges instead of 2 dozen large oranges, and substituting Imitation Mandarin Orange flavoring extract and Mandarin Orange Shade liquid or dry color for the flavoring and color named above.

ORANGE FRUIT ICE, No. 3

(5 gallon mix)

5 quarts cold-pack orange juice (packed 5 lbs. of sugar to each gallon of juice)[2],
12 lbs. granulated sugar,
1 to 2 ounces "Snow",
3 ounces citric acid crystals,
True Orange Flavoring extract or emulsion, to taste,
Navel Orange Shade Yellow extract or emulsion, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

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[1]If the oranges are not juicy or a richer ice is desired, increase the number of oranges accordingly.

[2]These are the proportions in the cold-pack orange juice most generally used and easily obtainable. It contains 36½ per cent. sugar by weight. If a juice with other proportions of sugar is used, the amount of sugar added in the mix should be varied accordingly.

PEACH FRUIT ICE, No. 1

(5-gallon mix)

5 quarts cold-pack peaches (2 to 1)[1],
12½ lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Peach Flavoring extract or emulsion, to taste,
Navel Orange Shade Yellow, dry or liquid color, to suit,
Water to make 5 gallons.

Crush peaches to a pulp.

In other respects, follow directions on pages 344-345.

PEACH FRUIT ICE, No. 2

(5-gallon mix)

9 pounds fresh ripe peaches,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Peach flavoring extract or emulsion, to taste,
Navel Orange Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Peel and pit peaches and crush to a pulp.

In other respects, follow directions on pages 344-345.

PINEAPPLE FRUIT ICE

(5-gallon mix)

1 No. 10 can cold-pack pineapple (crushed),
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Pineapple flavoring extract or emulsion, to taste,
Navel Orange Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

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[1]For methods adapting other preserved peaches for use in this formula, see page 280.

PLUM FRUIT ICE, No. 1

(5-gallon mix)

5 quarts cold-pack plums (2 to 1)[1],
13 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Plum Flavoring Extract, to taste,
Damson Shade Blue, Strawberry Shade Red or Lemon Shade Yellow (according to the variety of plums used) dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

PLUM FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh ripe plums,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Plum Flavoring Extract, to taste,
Damson Shade Blue, Strawberry Shade Red or Lemon Shade Yellow (according to the variety of plums used) dry or liquid color, to suit,
Water to make 5 gallons.

Cook plums in just enough water to cover, until soft. Strain through sieve or cloth.

In other respects, follow directions on pages 344-345.

POMEGRANATE FRUIT ICE

(5-gallon mix)

6 doz. ripe pomegranates of good size,
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Blood Orange Shade dry or liquid color, to suit,
Water to make 5 gallons.

Cut the pomegranates in two, remove seeds, and press out pulp and juice.

In other respects, follow directions on pages 344-345.

[1]For method of adapting other preserved plums for use in this formula, see page 280.

RAISIN FRUIT ICE

(5-gallon mix)

5 lbs. sultana raisins[1],
12 lbs. granulated sugar,
1 to 2 ounces "Snow",
1 ounce citric acid crystals,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

Stem and seed the raisins. Put through meat chopper using fine plate. Boil for about 10 minutes in 2 quarts of water. Strain through sieve, pressing through as much pulp as possible.

In other respects, follow directions on pages 344-345.

RASPBERRY FRUIT ICE, No. 1

(5-gallon mix)

5 quarts cold-pack red raspberries (2 to 1)[2],
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Raspberry flavoring extract or emulsion, to taste,
Raspberry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

RASPBERRY FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh ripe red raspberries,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Raspberry flavoring extract, to taste,
Respberry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Crush raspberries and strain through sieve or double cloth.

In other respects, follow directions on pages 344-345.

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[1]Any full-flavored raisins may be used. Sultanas are designated because of their flavor.

[2]For method of adapting other preserved raspberries for use in this formula, see page 280.

RASPBERRY AND CURRANT FRUIT ICE

(5 gallon mix)

3 quarts cold-pack red raspberries (2 to 1)[1]
1 quart fresh, ripe, red currants,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Raspberry flavoring extract or emulsion, to taste,
Raspberry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Crush currants and strain through sieve or double cloth.

In other respects, follow directions on pages 344-345.

RHUBARB FRUIT ICE

(5-gallon mix)

10 bunches rhubarb,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Creme de Menthe Shade Liquid or dry color,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

Wash rhubarb and cut into small pieces. Put into cooking vessel with about one-quarter of the sugar and cover with water. Stew gently (do not allow to boil) until it is soft like a sauce. Take from fire, strain through a sieve or cloth, and cool.

Color mix, when made, with one part of Creme de Menthe liquid or dry color to 20 parts, by volume, of Caramel Shade Brown dry color. Dissolve the Caramel Shade Brown in a little water before adding to mix.

In other respects, follow directions on pages 344-345.

STRAWBERRY FRUIT ICE, No. 1

(5-gallon mix)

5 quarts cold-pack strawberries (2 to 1)[2],
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Strawberry flavoring extract or emulsion, to taste,
Strawberry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

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[1]For method of adapting other preserved raspberries for use in this formula, see page 280. If fresh ripe raspberries are preferred, use 2 quarts and increase quantity of sugar to 17 lbs.

[2]For method of adapting other preserved strawberries for use in this formula, see page 280.

STRAWBERRY FRUIT ICE, No. 2

(5-gallon mix)

4 quarts fresh, ripe strawberries,
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Strawberry flavoring extract or emulsion, to taste,
Strawberry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Crush strawberries and strain through sieve or cloth.

In other respects, follow directions on pages 344-345.

TAMARIND FRUIT ICE

(5-gallon mix)

4 quarts of tamarinds in sirup,
12 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Maple Shade Brown dry color, to suit,
Water to make 5 gallons.

Add about one quart of water to tamarinds and heat (do not allow to boil) until they are nearly liquid. Cool. Strain through sieve or cloth.

In other respects, follow directions on pages 344-345.

TOMATO FRUIT ICE

(5-gallon mix)

For service with or after meat course.

1 No. 10 can tomato pulp,
8 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
Water to make 5 gallons.

Heat the tomato pulp in about half the water, allowing it to simmer for awhile, but not to boil. Strain and cool.

In other respects, follow directions on pages 344-345.

WATERMELON FRUIT ICE

(5-gallon mix)

2 quarts diced watermelon pulp,
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
½ ounce citric acid crystal,
Imitation Watermelon Flavor, to taste,
Raspberry Shade Red color, to suit,
Water to make 5 gallons.

Cut the pulp or red meat of a ripe watermelon into 1-inch cubes. Do not put these into the freezer, as the dasher would mash them, but scatter them through the packer can while the frozen Ice is drawn into it.

In other respects, follow directions on pages 344-345.

WATER ICES

Water Ices are, in many respects, very similar to Fruit Ices. When producing Fruit Ices, the flavoring properties are usually made up of a good flavoring extract combined with fruit juice or fruit pulp, while the flavoring properties of Water Ice are made up entirely of flavoring extracts. There are many who prefer Water Ice with straight extracts for flavor, while others fancy the Water-Ice that contains some fruit juice, even though the flavoring extract actually supplies the largest portion of the flavoring. When using a high grade flavor such as any of the Zanzibar Brand Flavors, or Heller's Flavoring Emulsions, in Water Ice, the finished delicacy will appeal to the most critical. A small proportion of fruit can be added, if desired.

For those desiring to produce the ordinary grades of Water-Ices such as have been commonly used in the past, and, many of which can be made very economically, we show a number of formulas on the following pages.

Heller's Ice-Berg saves a lot of time and trouble for the ice-cream manufacturer in producing sherbets, water ices, punches, etc., of high quality. Ice-Berg is a complete product in itself. When producing sherbets, water ices, etc., with this product, it is necessary only to add sugar and water, and freeze. It is perfectly standardized, scientifically processed, and easily handled. In appearance, taste and ability to stand up under adverse conditions, it is a superior article.

Heller's Ice-Berg is prepared in the following flavors:

Lemon, True,
Pineapple, Imitation,
Cherry, Imitation,
Grape, Imitation,
Strawberry, Imitation,
Apple, Imitation,
Orange, True,
Raspberry, Imitation,
Lime, Imitation,
Peach, Imitation,
Apricot, Imitation,
Watermelon, Imitation,
Champagne, Imitation,
Rum, Imitation,
Anisette, Imitation,
Creme-De-Menthe, Imitation.

Aside from the Lemon and Orange, Ice-Berg is flavored with the very highest quality of Imitation flavors. It is temptingly colored to resemble luscious ripe fruit. It can be relied upon to please better than the uncertain home-mixed product of the past.

For directions, see page 344, omitting fruits and fruit juices.

Frozen Suckers, Popsicles and Ice Poles are registered trade names of Water Ices, frozen in forms around a stick, resembling elongated lollypops.

Piccaninny Freeze is the registered trade name of a Water Ice in the form of a reduced slice of watermelon.

ANISETTE WATER ICE

(5-gallon mix)

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
True Anise Flavoring extract or emulsion, or
Imitation Anisette Flavoring extract, sufficient to give desired flavor,
Maple Shade Brown dry color, to suit,
Water to make 5 gallons.

Follow directions on page 344.

CREME-DE-MENTHE WATER ICE

(5-gallon mix)

An Ice to accompany game.

4 quarts creme-de-menthe sirup[1],
16 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
True Peppermint flavoring extract or emulsion, to taste,
Creme-de-Menthe Shade Green dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on page 344.

LEMON WATER ICE, No. 1

(5-gallon mix)

17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Lemon flavoring extract or emulsion to give desired flavor,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on page 344, except that no fruit or fruit juice is to be added.

[1]To reduce cost of imported Creme de Menthe, either an American product or a less quantity—two quarts or even one quart—may be used, and the desired flavor obtained by increasing the quantity of True Peppermint flavoring extract or emulsion.

LEMON WATER ICE, No. 2

(5-gallon mix)

1½ lbs. powdered lemon juice[1],
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Lemon flavoring extract or emulsion, to taste,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

LIME WATER ICE

(5-gallon mix)

17 lbs. granulated sugar,
1 to 2 ounces "Snow",
3 ounces citric acid crystals,
True Lime flavoring extract or emulsion, sufficient to give desired flavor,
Lemon Shade Yellow, and Creme-de-Menthe Shade Green dry or liquid color, in proportions of 20 parts to 1, to suit,
Water to make 5 gallons.

Follow directions on page 344, except that no fruit or fruit juice is to be added to Ice.

MAPLE WATER ICE, No. 1

(5-gallon mix)

3 lbs. maple sugar,
12 lbs. granulated sugar,
1 to 2 ounces "Snow",
Maple Flavoring extract or emulsion, to taste,
Maple Shade Brown dry color, to suit,
Water to make 5 gallons.

Powder maple sugar, cover with water and heat until it is converted into a sirup. Then cool.

In other respects, follow directions on page 344.

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[1]This quantity is for the grade of dry or powdered lemon juice usually obtainable, 9 tablespoonfuls of which is equivalent to 6 lemons. If a more or less concentrated product is used a proportionately greater or less quantity should be used.

MAPLE WATER ICE, No. 2

(5-gallon mix)

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
Maple flavoring extract or emulsion, sufficient to give desired flavor,
Maple Shade Brown dry color, to suit,
Water to make 5 gallons.

Follow directions on pages 344-345.

MARASCHINO WATER ICE

(5-gallon mix)

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2½ ounces citric acid crystals,
Maraschino flavoring extract or emulsion, sufficient to impart desired flavor,
Cherry Shade Red dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on page 344.

A whole Maraschino cherry, added just before serving, greatly improves the appearance. If an ice of distinctive flavor is desired, add before freezing, a small quantity (determined by taste) of Imitation Wild Cherry flavoring extract.

MINT WATER ICE

(5-gallon mix)

Frequently served with or following roast lamb.
2 doz. stalks fresh spearmint[1],
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 ounces citric acid crystals,
True Peppermint flavoring extract or emulsion, to taste,
Creme-de-Menthe Shade Green dry or liquid color, to suit,
Water to make 5 gallons.

Chop mint to pulp; rub with about one pound of the sugar, separate sugar and squeeze onto it as much of the juice of the mint as possible, discarding the residue.

In other respects, follow directions on page 344.

[1]If fresh spearmint is unobtainable, a very fine Ice may be made without it by increasing the quantity of flavoring extract or emulsion used.

ORANGE WATER ICE

(5-gallon mix)

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
3 ounces citric acid crystals,
True Orange flavoring extract or emulsion, sufficient to give desired flavor,
Navel Orange Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on page 344, except that no fruit or fruit juice is added.

ORGEAT WATER ICE

(5-gallon mix)

"Orge" is the French for "Barley." "Orgeat Ice" is Barley Ice, as Orgeat formerly meant a sirup flavored with barley. The word is now used to designate a sweetened emulsion of almonds. The trade, accustomed to French names and usages, will recognize Orgeat Ice as a barley-flavored ice.

2 quarts barley sirup,
1 quart orange flower water,
10 lbs. barley sugar,
3 lbs. granulated sugar,
1 to 2 ounces "Snow",
1 ounce citric acid crystals,
True Bitter Almond flavoring extract, to taste,
Lemon Shade Yellow dry or liquid color, to suit,
Water to make 5 gallons.

Barley sirup and barley sugar are bought at confectioners' supply houses.

Orange flower water can be bought at druggists' and perfumers' supply houses. If preferred, True Orange flavoring extract or emulsion can be used instead, in quantity to suit taste.

Follow directions on page 344.

PISTACHIO WATER ICE

(5-gallon mix)

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
Pistachio flavoring extract or emulsion, sufficient to give desired flavor,
Pistachio Shade Green dry or liquid color, to suit,
Water to make 5 gallons.

Follow directions on page 344.

The addition of a small quantity of True Almond flavoring extract or True Almond flavoring emulsion, adds a zest to the flavor that is very pleasing.

SORBETTI MISTI

(5-gallon mix)

"Sorbetti" is the Italian for "Water Ice" and "Misti" for Mixture: hence "Sorbetti Misti" is a Mixed Water Ice.

15 lbs. granulated sugar,
1 to 2 ounces "Snow",
Water to make 5 gallons.

Combine these in accordance with the directions on page 344.

Flavor to taste with True Clove and True Cassia liquid flavoring extracts, using much less of the Clove than of the Cassia.

Add not more than half of one grated nutmeg.

Then continue the freezing and hardening.

RUSSIAN TEA ICE

(5-gallon mix)

10 ounces black or green tea, as preferred,
2 dozen large lemons,
14 lbs. granulated sugar,
1 to 2 ounces "Snow",
Water to make 5 gallons.

Using all the water, brew a strong tea, not steeping so long that it will taste of tannin. Strain and cool.

Peel and seed the lemons, removing all the white inner skin to avoid the possibility of it imparting a bitter flavor, and press out pulp and juice.

Using the tea in place of water, prepare and freeze mix in all other respects as directed on page 344.

CAFÉ NOIR ICE

(5-gallon mix)

"Café Noir" is the French for "Black Coffee": hence, this is a Black Coffee Ice.

12 lbs. granulated sugar,
1 to 2 ounces "Snow",
True Coffee flavoring paste, to taste,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

Make according to directions on page 344.

Is very nice served with a topping of whipped cream or of Heller's Snow-Drift.

GRANITES

Granites are fruit ices and water ices frozen with but little stirring of the mix, so that they have a rough, icy texture.

A true fruit granite should contain comparatively little added water, consisting of a variety of fruits and nuts resembling a frozen fruit salad. The following by way of example.

FRUIT GRANITE

6 ripe apples,
6 ripe peaches,
12 bananas,
12 lemons,
12 medium oranges,
1 pineapple,
2 oz. seeded raisins,
10 lbs. granulated sugar,
1 to 2 oz. "Snow",
2 oz. citric acid crystals,
Water to make 5 gallons.

Peel all fruit, squeeze the juice from the lemons and oranges, rejecting seeds and pulp, and blanch the nuts. Finely chop nuts and fruits and add as for fruit ices.

Any of the fruit-ice formulas (pages 345 to 359) may be used in making granites if the quantity of fruit is reduced (where fruit pulp is included, about one-third) and the mixture then frozen with but little stirring.

The water-ice formulas (pages 361 to 365) are satisfactory formulas for granites without any change whatever when frozen slowly with but few turns of the paddles. Heller's Ice-Berg can be used instead. It is already mixed. Simply add sugar and water and freeze.

SHERBETS

Sherbets are ices usually made with milk (either whole or skimmed) and sometimes with cream, either with or without the addition of water. They are sweetened (usually with granulated sugar), and flavored with fruit pulp, fruit juice, flavoring extracts or emulsions, cordials, spices, etc.

Sherbets, as well as ices, need "Snow" to give them body and stability in transit and in the dealer's cabinet. Their flavor should be fortified with Zanzibar-Brand Flavoring Extracts or Heller's Flavoring Emulsions, and should be colored attractively with Malaboza Pure Food Color of the right shade. These are products which do not freeze out and "Snow" keeps them in perfect emulsion, uniform from top to bottom till served.

GENERAL DIRECTIONS FOR MAKING SHERBETS

Using Whole or Skimmed Milk

First—Put sugar, then "Snow," into a crock, glass-lined tank, or other non-metallic vessel and mix thoroughly.

Second—When well mixed, add milk slowly, stirring until mixture becomes like a heavy cream.

Third—Add rest of milk, flavoring extract or emulsion, and color, stirring until well mixed.

Fourth—Freeze in same manner as 10 or 12 per cent. Ice-Cream, but with a brine temperature about six degrees lower and taking fully a third longer to freeze.

Fifth—When partly frozen, add through the fruit funnel first citric acid solution and then precooled fruit and fruit juices.

Sixth—The overrun must be governed by the proportion of milk solids in the Sherbets, varying between 25 or 30 per cent. for a Skim-milk Sherbet and perhaps 35 to 40 for a Whole-milk Sherbet. Except for immediate use on special or private orders, it would be inviting complaints to obtain all the swell that could be obtained. "Snow" furnishes sufficient body and stability to make transportation safe and to prevent the precipitation of color and sugar. "Snow" serves a purpose in Sherbets that gelatin and Meloine serve in Ice-Cream: it makes them smooth and uniform from top to bottom.

Seventh—Draw off soft in pre-cooled, paper-lined cans and put into hardening room or pack immediately, using a sufficiently larger proportion of salt with the ice to lower the temperature about six degrees below that required for Ice-Cream of medium standard.

For power mixer, increase quantities of ingredients given in formula in proportion to the size of mix desired. Put sugar and "Snow" into

mixer and let them mix about one minute. Then slowly, while mixer is running, pour in water until the mixture has become like a heavy cream. Then add milk, flavoring and color, and finally, when Sherbet is partly frozen, the fruit and fruit juice. The mixer itself should preferably be glass lined.

CITRIC ACID SOLUTION

1 gallon of water,
4 lbs. citric acid crystals.

Add citric acid crystals to water and stir until dissolved. It will dissolve readily at room temperature or lower, but dissolving may be hastened, if desired, by heating the mixture.

These proportions make a 32½ per cent. solution. It is not possible to use citric acid crystals successfully with Sherbets as there is not moisture enough to dissolve them, except in the milk. To add the crystals to the milk in undiluted form would be very apt to curdle it.

ADAPTING FRUIT-ICE AND WATER-ICE FORMULAS TO SHERBET MAKING

Any of the formulas for fruit or water ices, on pages 345 to 365, may be used as formulas for Sherbets by substituting whole or skimmed milk for the water added after "Snow" and sugar are mixed, and using citric acid solution in place of citric acid crystals. The directions for making are the same except that citric acid solution and pre-cooled fruit and fruit juice are not added until the Sherbet is partly frozen, and then they are added through the fruit funnel, while paddles are revolving.

For each ounce of citric acid crystals in formula use 2½ fluid ounces of citric acid solution made in accordance with the formula above.

GRAPE SHERBET

(5-gallon mix)

2 quarts grape juice,
16 lbs. granulated sugar,
Juice of 1 dozen lemons,
1 to 2 ounces "Snow",
2 gallons milk,
Water to make 5 gallons.

Prepare mix as directed on page 367. Flavor to taste with Imitation Grape flavoring extract or emulsion. Color according to color of grape juice used: if green, with 20 parts of Lemon Shade Yellow and 1 part Creme de Menthe Shade liquid or dry color; if red, with Cherry Blossom

Shade Pink liquid or dry color; if purple, with Pansy Shade Violet dry color.

Add milk when mix is nearly frozen and, in other respects, follow the same directions.

ORANGE SHERBET, No. 1

(5-gallon mix)

2¼ lbs. or 1½ pts. concentrated orange juice,
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 gallons milk,
5 fl. oz. citric acid solution,
Water to make 5 gallons.

Prepare mix as directed on page 367. Flavor to about half desired strength with True Orange flavoring extract or emulsion. Color to suit with Navel Orange Shade Yellow liquid or dry color. Add milk when mix is nearly frozen and in other respects follow the same directions.

ORANGE SHERBET, No. 2

(5-gallon mix)

2 doz. large oranges,
1 doz. lemons,
15 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 gallons milk,
Water to make 5 gallons.

Peel and seed the oranges and lemons, carefully removing all the white inner skin. Press out juice and pulp.

Prepare mix as directed on page 367. Flavor well with True Orange flavoring extract or emulsion and color with Navel Orange Shade Yellow liquid or dry color.

Add milk when mix is nearly frozen and, in other respects, follow the directions on page 367.

MALTED-MILK SHERBET

(5-gallon mix)

22¼ lbs. malted milk,
5¼ lbs. granulated sugar,
1 pt. Meloine solution[1]
2 oz. gelatin,
Malaboza Pure Food Color to suit,
Water to make 5 gallons.

Mix, freeze, harden and pack in same manner as Ice-Cream.

The sherbet will contain 3.50 per cent. milk fat; 8.57 per cent. milk-solids-not-fat and 57 per cent. total solids.

[1]If Mello-Freeze is preferred, the solution should be made exactly like Meloine solution, with water and sugar, but it can be added at once.

LEMON SHERBET

(5-gallon mix)

2 doz. large lemons,
17 lbs. granulated sugar,
1 to 2 ounces "Snow",
2 gallons milk,
Water to make 5 gallons.

Peel and seed lemons carefully, removing all the white inner skin. Press out juice and pulp.

Prepare mix as directed on page 367. Flavor till mix tastes like a strong lemonade with True Lemon flavoring extract or emulsion. Color with Lemon Shade Yellow liquid or dry color.

Add milk when mix is nearly frozen and, in other respects, follow the same directions.

GENERAL DIRECTIONS FOR MAKING SHERBETS WITH CREAM

First—Put sugar and "Snow" into a crock, glass-lined tank, or other non-metallic vessel and mix thoroughly.

Second—When well mixed, add water slowly, stirring briskly until mixture becomes like a heavy cream.

Third—Add fruit and fruit juice, flavoring extract or emulsion, citric acid solution, color, and rest of water, stirring until well mixed.

Fourth—Freeze in same manner as 10 or 12 per cent. Ice-Cream, but with a brine temperature about seven degrees lower and taking fully a third to a half longer to freeze.

Fifth—When Sherbet is partly frozen, while paddles are revolving, add pre-cooled cream through fruit funnel.

In all other respects follow directions for making Sherbets with milk (page 367).

THE USE OF CREAM IN MILK SHERBET FORMULAS

Cream (with enough water added in the mix to make required volume) may be used in place of milk in any of the formulas for "Sherbets Made with Milk". When this is done, the "General Directions for Making Sherbets with Cream," above, should be followed.

Use the quantity specified below of whichever cream may be available, and add enough water to the mix to make 5 gallons in all.

15 per cent. cream, 4¾ pints;
16 per cent. cream, 4¾ pints;
18 per cent. cream, 4½ pints;
20 per cent. cream, 4¼ pints;
22 per cent. cream, 4 pints;
30 per cent. cream, 3 pints;
36 per cent. cream, 2¼ pints;
40 per cent. cream, 1¾ pints.

SORBETS

"Sorbet" is French, from the Italian, "Sorbetti," meaning Sherbet.

A Sorbet is a superior Sherbet, somewhat smoother and of finer texture. Scalding the milk, when milk is used, and adding the whites of eggs, is a satisfactory way of securing the desired smoothness and fineness. Any Sherbet formula becomes a Sorbet formula by scalding the milk used in it and adding to the 5-gallon mix when it is partly frozen, the lightly beaten whites of 15 eggs, mixed with a little water. Special formulas for Sorbets are, therefore, not required.

An economical substitute for the whites of eggs, with better body and better dishing quality than eggs, is Heller's Snow-Drift. It "stands up" better, has a delightful flavor closely resembling vanilla flavored egg white, and is pure and wholesome. It is beaten up with part of the sugar and water provided for in the sherbet formula. After the scalded milk has been added and the mix is again nearly frozen, add the beaten Snow-Drift.

A sorbet so made has the agreeable smoothness of a good Ice-Cream. Two ounces of Snow-Drift goes as far as the whites of fifteen eggs.

FRAPPÉS

A Frappé is a cream Sherbet frozen to the consistency of mushy snow, without hardening. It lacks stability and is on the verge of melting when served. It is, therefore, an unsatisfactory dish to serve to those who are not familiar with it. Caterers often bring their equipment to the customer's kitchen in order to serve Frappés in proper condition, directly from the freezer.

Any cream Sherbet may be frozen as a Frappé.

GRAPE FRAPPÉ

(1-gallon mix)

3 pints grape juice,
Juice of 6 large oranges,
Juice of 3 large lemons,
1½ lbs. granulated sugar,
1/5 to 2/5 ounce "Snow",
2 pints 30 per cent. cream,
Water to make 1 gallon.

Combine all the ingredients except the cream. Flavor to taste with Imitation Grape flavoring extract or emulsion and color to suit with Riverside Violet Shade dry color.

Put into freezer and, when partly frozen, add pre-cooled cream.

A Frappé should be soft, frozen only to the consistency of mush, when served.

GOOSEBERRY FOOL (Frappé)

(1-gallon mix)

"Fool," as here used, is from French "fouler," to press.

Add about one-third the sugar to gooseberries, and enough water barely to cover them. Stew until soft. Then strain.

Color the mix to suit with Clover Leaf Shade Green liquid or dry color.

In other respects follow above instructions, putting in the pre-cooled cream shortly before drawing.

Freeze and keep soft, with a mush-like consistency.

When fresh fruit is not available, substitute for the stewed gooseberries two pounds of gooseberry jam and omit one-half pound of sugar.

BLACKBERRY FOOL (Frappé)

(1-gallon mix)

Use blackberries instead of gooseberries and Heliotrope dry color instead of Clover Leaf Shade Green. Follow the formula for Gooseberry Fool in all other respects.

CARAMEL FRAPPÉ

Make 3 quarts caramel sauce in accordance with the formula on page 385.

Put into freezer, and when it is partly frozen, add one quart of precooled 18 per cent. cream.

Freeze to a mush-like consistency, similar to soft snow.

CHOCOLATE FRAPPÉ

(1-gallon mix)

Make 3 quarts of Coa-Sauce in accordance with the directions on page 386.

Put into freezer and, when it is partly frozen, add one quart of 18 per cent. cream.

Freeze until it is about like moderately soft snow.

FROZEN SOUFFLÉS

A Soufflé is a cream ice containing egg, frozen very light and frothy, as the name shows. Soufflé is from the French, "souffler," to blow, which in turn is from the Latin, "sub," under, and "flo," blow—to blow under. As commonly made, Soufflés (not frozen) are light, frothy dishes in which the frothy substance is fixed by heat.

Any of the Sherbet formulas (pages 368 to 370) will make a Soufflé. To the materials named for the 5-gallon mix, add, when mix is partly frozen, from 4 to 10 pre-cooled whole eggs, well beaten. Take care to freeze it with a maximum of swell so as to obtain a light and frothy texture.

ORANGE SOUFFLÉ

(1-gallon mix)

2 quarts orange juice,
½ pint lemon juice,
1/5 to 2/5 oz. "Snow",
4 whole eggs,
1 pint 30 per cent. cream,
Water to make 1 gallon

Prepare mix in accordance with the directions on page 370, except special treatment for eggs and cream.

Flavor well with True Orange flavoring extract or emulsion.

Beat eggs to a froth. Whip cream till stiff.

When mix is partly frozen add beaten eggs and finally whipped cream.

Freeze and keep very light and frothy.

BANANA FLUFF (Soufflé)

(1-gallon mix)

6 large ripe bananas,
Juice of 1 lemon,
2 oz. grated or shredded coconut,
1 lb. powdered sugar,
Whites of 8 eggs or 6½ fl. oz. eggs whites,
1 qt. 30 per cent. cream,
1/5 to 2/5 oz. "Snow",
Water to make 1 gallon.

Peel and slice bananas. Sprinkle with lemon juice and coconut, and put on ice for one hour. Then mash with wooden spoon.

Mix "Snow," sugar and water as directed on page 371, add bananas to it, and fold in the egg whites beaten until very stiff.

When partly frozen add the cream well whipped and complete freezing in the same manner as other Soufflés.

PUNCHES

"Punch" is the English form of the Hindu "Panch," derived from the Sanscrit "Pancha," five. The original formula had five ingredients in the mixture: arrack, tea, sugar, lemon, and water.

Punches, as we know them, are water ices or fruit ices flavored with wines, liquors, spices or cordials.

GRAPE PUNCH

Make a lemon water-ice mix according to one of the formulas on pages 361-362.

Add three quarts grape juice, and flavor to taste with Imitation Grape flavoring extract or emulsion.

Color to desired shade with Riverside Violet Shade dry color.

Freeze, harden and pack in usual way and, when serving, top each portion with a slice of orange.

CHAMPAGNE PUNCH

Make a lemon water-ice in accordance with the formulas on pages 361-362.

Flavor well with Imitation Champagne flavoring extract.

Freeze, harden and pack in usual way.

ROMAN PUNCH

Make an orange water-ice, in accordance with the formula on page 364.

Flavor strongly with Imitation Roman Punch flavoring extract.

Freeze, harden and pack in usual way.

ROYAL PUNCH

Make 1 gallon pineapple fruit-ice mix, according to the formula on page 354.

Make ½ gallon orange ice mix, in accordance with one of the formulas on page 353.

Combine the two mixes and flavor them to taste with Imitation Maraschino flavoring extract or emulsion and about one-half as much Imitation Rum flavoring extract.

Put into freezer. When about half frozen, add the stiffly beaten whites of six eggs, to which one pound of powdered sugar has been added.

Complete the freezing, hardening and packing in usual way.

SPICED PUNCH

(5-gallon mix)

18 lbs. granulated sugar,
1 to 2 ounces "Snow",
3 ounces citric acid crystals,
True Cassia (cinnamon) and True Clove flavoring extract, to taste,
Ground nutmeg, to taste,
Caramel Shade Brown dry color, to suit,
Water to make 5 gallons.

Boil about three-quarters of the sugar and one-half of the water together until they form a good sirup. Cool.

Make mix as directed on page 344, adding the sirup when the last of the water is added.

Flavor to taste with True Cassia (cinnamon) and True Clove flavoring extract, being careful not to use too much while getting a real cinnamon flavor with the zest of cloves.

Serve with a trace of ground nutmeg dusted over the top.

The punch may be varied by adding, when it is nearly frozen, two pounds of chopped maraschino cherries or one pound of hickory nut meats, chopped not too fine, or one pound of chopped maraschino cherries and one pound of chopped hickory nut meats mixed together.

LACTOS AND SYLLABUBS

Lactos differ from sherbets only in that butter milk, or curdled whole or skimmed milk is used in place of fresh sweet milk. Sherbet formulas (pages 368 to 370) may be used as Lactos formulas simply by making this substitution.

A syllabub is a punch made of cream or rich curdled or "clabbered" milk, very highly flavored. Any of the punch formulas (pages 375 to 376) will serve as a syllabub formula if curdled or clabbered milk or cream is used in place of water.

Syllabubs were originally a drink made of milk, sweet cake and wine, prepared for the May feast in old England.

ICE-CREAM SPECIALTIES

A book larger than this volume could be compiled, devoted exclusively to Ice-Cream specialties. Only a few of them can be given. Several additional specialties are described in the list of Menu Terms on pages 391-395. As they are in most cases merely combinations of Ice-Creams for which formulas have already been provided, the ingenious manufacturer or caterer can easily make such combination as suits his fancy or such as may be appropriate to the occasion.

ALASKA BAKE

Cover with meringue a brick of Ice-Cream, frozen hard, and dust it with powdered sugar. Cover a board with slices of sponge cake, place the Ice-Cream on the cake and put into a hot oven to brown the meringue. It will brown so quickly that care must be taken to prevent scorching.

Garnish with maraschino cherries before serving.

AMERICAN BEAUTY

Put preserved strawberries in bottom of parfait glass. Fill rest of glass alternately with vanilla and deeply colored strawberry Ice-Cream. Top with whipped cream and a strawberry.

BLACK-EYED SUSAN

Put chocolate Ice-Cream in bottom of sundae glass. Fill rest of glass with vanilla Ice-Cream. Decorate with a Black-Eyed Susan made by using unblanched almonds for petals, and a small chocolate cream for a center.

FROZEN CHARLOTTE RUSSE

Whip 30 to 40 per cent. cream and, when fully whipped, pour a little cooled gelatin solution slowly over whipped cream while another keeps gently and slowly turning the mass upward from below with clean, bared arms and opened hands, the fingers spread wide. This will cause it to stand up under adverse conditions.

Line a charlotte cup with fairly dried lady fingers. Fill two-thirds full of Ice-Cream of any flavor desired. Fill rest of cup with the stiff whipped cream, using a baker's or confectioner's regulation rubber or canvas pastry bag with nipple and ornamenting tube that the whipped cream may have a finished and attractive appearance. Put into cooling room or into a good refrigerator to chill the whipped cream, and serve when well chilled.

A more economical method is, to use Heller's Snow-Drift (instead of the whipped cream and gelatin solution) for topping. It is beaten up with sugar and water till light and fluffy and it has sufficient body to "stand up" without adding gelatin solution. The result is beautiful in appearance and deliciously rich and creamy in taste.

Wine glasses of the right size may be used instead of Charlotte cups, or the paper cup may be removed after the Ice-Cream has been put in and properly hardened.

ICE CREAM ECLAIRS

Fill eclair shells, split lengthwise, with vanilla Ice-Cream. Pour over each as served a liberal portion of Coa-Sauce made according to the formula on page 386.

Chocolate or any other kind of Ice-Cream may be used as a filling instead of vanilla, but in that case use another sauce. Formulas for several sauces, some of which can be used with any Ice-Cream, are on pages 383 to 388.

ICE-CREAM CROQUETTES
With Green Peas

Mold vanilla Ice-Cream to shape. Cover well with grated chocolate macaroons. Serve on whipped cream with small green candies to simulate peas.

INDIVIDUAL MERINGUES

10 lbs. granulated sugar,
Whites of 21 eggs (or 2 pts. egg whites).

Beat egg whites until stiff, gradually adding sugar while doing so.

Take a smooth board, free of knots and gum. Wet it thoroughly. Cover one side with clean spongy paper and wet it well. Onto this paper, while still wet, drop the beaten egg whites and sugar from a bakers' or confectioners' regulation rubber or canvas pastry bag with nipple and ornamenting tube, forming semi-spherical cakes, about 2½ inches in diameter, with their exterior ornamented like kisses. The upper halves can be decorated, if desired, with red rosettes and green leaves.

Put into slow oven and bake until outer surface is well hardened (about 1½ hours). Pick up and scoop out the center from the bottom, making them into hollow shells. The center and bottom will be soft because of the wetness of board and paper.

Place these shells in well-greased pan and return to oven to dry out; that is, for about thirty minutes. Fill centers of two of these shells with Ice-Cream and join together, forming a ball-like Ice-Cream meringue ready for service.

FRESH FRUIT SALAD

Make a regular vanilla mix of the desired standard:

For 100-lb. mix.....69.88 lbs.
For 5-gal. mix.....3½ gals.
For 100-gal. mix .....69 gals. 7 pts.

Color with Cherry Shade Red liquid or dry color.

Take:

	For 100-lb. mix	For 5-gal. mix	For 100-gal. mix
Seedless or seeded grapes	3.874 lbs.	1¾ lbs.	35 lbs.
Fresh ripe peaches	2.22 lbs.	1 lb.	20 lbs.
Ripe bananas	2.768 lbs.	4 large	80 large
Maraschino cherries	1.176 lbs.	½ pt.	1¼ gals.
Shredded coconut	1.11 lbs.	½ lb.	10 lbs.
Fresh ripe apricots	2.22 lbs.	1 lb.	20 lbs.
Grated pineapple	2.435 lbs.	1 pt.	2½ gals.
Oranges	0.261 lbs.	4 large	80 large

Remove seeds and skin of oranges and take out pulp, crushing as little as possible. Peel and pit other fruits and chop fine. Pre-cool the fruits.

When regular vanilla mix is partly frozen, while the dasher continues turning, add pre-cooled 30 per cent. cream, as follows:

For 100-lb. mix.....14.056 lbs.
For 5-gal. mix.....5¾ pts.
For 100-gal. mix .....14 gals. ¾ pt.

This improves the flavor and texture of the Ice-Cream and at the same time restores milk fat displaced by fruit, bringing 14 per cent. mix up to standard and adding to all lower standards a slight surplus of milk fat.

When mix is very nearly frozen, add also the pre-cooled fruit mixture through the fruit funnel.

Complete the freezing, draw into brick pans or brick boxes, and harden in usual way.

This fruit salad may also be made with New York or Neapolitan Ice-Cream mix, merely by substituting New York or Neapolitan mix for the regular vanilla mix and proceeding in all other respects as above directed.

FROZEN EGG NOG.

(1-gallon mix)

A nog is a small pot or mug: hence, egg nog is liquid or frozen egg mixture served in a nog.

3 quarts cream,
3 pounds powdered sugar,
8 fresh egg yolks.

Beat the eggs until frothy. Continue beating while gradually adding one-half of the sugar.

The cream may be of any convenient degree of richness, but 30 per cent. is best. Whip the cream. Add to it gradually, while still whipping the remaining half of the sugar.

Combine the two mixtures. Flavor to taste with Imitation Rum flavoring extract. Add a pinch of Powdered Nutmeg.

Put into freezer. Freeze, harden and pack like Ice-Cream.

Serve in small pots or mugs.

LILLIAN RUSSELL

Named in honor of an American soubrette, born in Chicago, distinguished for her beauty of face and form.

Vanilla Ice-Cream in Cantaloupe, topped with whipped cream.

MAPLE PANACHE

Caramel Ice-Cream and Vanilla Ice-Cream, strewn lightly with chopped pecans and dressed with maple sauce (see formula, page 387).

A panache is a plume or bunch of feathers. The name is suggested by the maple sauce which flows over the Ice-Cream as the feathers flow over the shoulders of a plumed knight.

MERRY WIDOW

Named after a comic opera, composed by Franz Lehar.

Vanilla Ice-Cream with fresh strawberries, dusted with a powder of toasted piñon nuts, and dressed with Rum Sauce (formula, page 388).

PEACH MELBA

Named in honor of Dame Nellie Melba (stage name of Mrs. Charles Armstrong), Australian soprano.

Drain the sirup from canned, large, halved peaches, and soak them over night in Imitation Brandy flavoring extract.

Put a half peach in a dish, cover with Vanilla Ice-Cream, topped with a rose of whipped cream, and serve.

QUEEN ICE

Strawberry Ice-Cream above Tutti Frutti Ice-Cream, topped with whipped cream, and garnished with candied cherries.

LALLA ROOKH

Named for the heroine of Thomas Moore's poem of the same name, who was in love with Feramorz.

Vanilla Ice-Cream with Rum Sauce (see formula, page 388).

When serving, top with meringue made according to formula on page 384.

SAUCES, MERINGUES, BUTTERSCOTCH, ETC.

Dressings for Ice-Cream are often as important as the Ice-Creams themselves. Butterscotch, meringue and Coa Sauce, whether as dressings or as materials for use in Ice-Creams, are almost indispensable. The following recipes will therefore be found of value.

BUTTERSCOTCH

Butterscotch is a confection used as an ingredient of Bisque Ice-Creams.

(Formula to make 1 gallon; weight, 9.04 lbs.)

1¼ lbs. granulated sugar,
1¼ lbs. butter,
1¼ pints milk,
6 pints water,

Add sugar and butter to the water. Put over fire and boil until the mixture forms a soft ball when tested in cold water, or by sugar thermometer, 236 degrees F. and no more. Keep covered while boiling to prevent the formation of crystals on inner side of vessel.

Remove from fire and cool to 110 degrees. Do not stir while boiling nor until so cooled, as stirring would cause crystallization. Evaporation is allowed for.

Add milk, stirring it well in, and complete cooling.

MERINGUE

(As an Ingredient)

French name of a product which originated in Mehringen, Germany.

There are two kinds of meringue: one is used as an ingredient of bisque and biscuit Ice-Cream; the other as a dressing. The following formula is for meringue as an ingredient.

Whites of 10 eggs,
1 lb. granulated sugar,
4 teaspons Heller's Fancy Pastry Baking Powder,
Vanilla flavoring and True Bitter Almond flavoring extract, to taste.

Beat whites of eggs until stiff and dry.

Add ¾ lb. of sugar and beat until the mixture holds its shape. Sift rest of sugar and baking powder together, add flavoring to them, and fold into beaten egg whites and sugar.

Heller's "Snow-Drift" can be used to advantage as a substitute for the whites of eggs. It has more body and therefore holds its whip better as an ingredient. It is as tempting and always available.

Drop on unglazed paper and bake in slow oven about 30 minutes.

This meringue may be used instead of macaroons, lady fingers or other similar cake in bisque and bisquit Ice-Cream.

These meringues are also very fine for use in making high-grade Ice-Cream sandwiches, a slice of any desired Ice-Cream being placed between two of meringue.

MERINGUE

(For Topping Ice-Cream)

Whites of 5 doz. eggs or 3 pts. (scant) of egg whites,
Granulated sugar, ½ lb.
Vanilla flavoring, to taste.

Beat egg whites until stiff, gradually adding the sugar while doing so. Flavor to taste with vanilla flavoring. The beating will be done more quickly and more easily with a power beater.

These quantities of materials make a little more than 3¼ pints before beating and will increase to more than twice that volume if eggs are fresh. The finished product should cover about 10 square feet of surface.

A more economical, more convenient, and entirely practical method is, to use Heller's "Snow-Drift" (instead of the whites of eggs) for topping. It is fully as tempting and wholesome, can be flavored and colored, if desired, and provides a more enduring topping.

Cover the Ice-Cream with the meringue as desired. Place on a board and put into hot oven to brown meringue, being careful to remove before it scorches. It will brown very quickly without materially softening the Ice-Cream. Return to hardening room or hardening cabinet if necessary.

JELLY MERINGUE

Whites of 8 eggs,
One 15- or 16-ounce glass of current jelly.

Add jelly to whites of eggs and beat until very stiff.

Use as dressing on Ice-Creams, frozen custards and frozen puddings.

Any jelly preferred may be used in place of currant jelly. Quince jelly makes a very tasty and unique meringue, and grape jelly a very popular one.

CARAMEL SAUCE

For use over Ice-Cream and in Sundaes, Splits, etc.

(1-gallon mix)

7 lbs. sugar,
Water to make 1 gallon,
1 oz. citric acid crystals,
Carameline to give desired color,
Vanilla to taste.

Boil 1 quart of the water. Add sugar and citric acid crystals and stir until dissolved. Then add water to make 1 gallon. Add sufficient Carameline to make the right color. It will then have the proper caramel flavor.

Take from fire and add vanilla flavoring to taste.

CHOCOLATE FUDGE SAUCE

For use over Ice-Cream and in Sundaes, Splits, etc.

1 quart milk,
1 quart water,
2 lbs. granulated sugar,
6 oz. Zanzibar-Brand American Process Cocoa,
½ oz. corn starch,
½ pt. cold water,
2 oz. butter,
Vanilla flavoring to suit,
Carameline, to suit.

Larger batches may be made by increasing quantity proportionately.

Mix sugar and cocoa together; add the 1 quart of water and stir until well mixed and free of lumps.

Boil in steam-jacket kettle or over water for 15 minutes.

Mix corn starch with the ½ pint of cold water. Pour slowly in a small stream into the hot mixture, stirring well meanwhile.

Boil until mixture thickens, stirring frequently.

Take from fire. Add milk (previously heated, but not boiled), butter, sufficient vanilla extract to give desired flavor, and enough Carameline to make the preferred color. Strain.

It may then be used hot, or cooled and then used.

If a thin sauce is desired, omit the corn starch and the water in which it is mixed, or increase the quantities of water and milk added.

COA SAUCE

A Particularly Rich Cocoa Sauce for Use on Ice-Cream and in Sundaes, Splits, etc.

(To make 1 gallon)

1 lb. Zanzibar-Brand Coa Sauce,
4½ lbs. granulated sugar,
Water to make 1 gallon.

Mix Zanzibar-brand Coa Sauce and sugar thoroughly. Add sufficient warm water to make into a thick paste, stirring until well mixed and working out all lumps.

Put into steam-jacket kettle or into a vessel in which it may be cooked over water, and while stirring add enough water to make one gallon. Heat to boiling point. Boil one minute. Then take off fire and strain.

If a very rich sauce is desired, use milk instead of water.

FRUIT SAUCE

(To make 1 quart)

½ lb. butter,
1 lb. powdered sugar,
1½ pints mashed fruit,
Whites of 6 eggs.

Cream the butter. Beat whites of eggs. Gradually add to creamed butter first the powdered sugar and then the beaten egg whites. Beat well. Add the mashed fruit and beat until creamy.

Any fresh fruit that will mash well, such as strawberries, raspberries, pineapple pulp, peaches, pomegranates, or plums may be used. If canned fruit is used, drain off all sirup and reduce powdered sugar one-half.

JELLY SAUCE

(To make 1 gallon)

1½ pounds jelly,
¾ pound granulated sugar,
6 tablespoons corn starch.

Boil 3 quarts of water. Add jelly and sugar, stirring until they dissolve.

With a little cold water make a paste free of lumps of the corn starch and add it very slowly to the boiling mixture of water, jelly and sugar. Stir well and boil three minutes.

Any jelly may be used, preferably one with a rich fruit flavor.

Fortify the fruit flavor, after the sauce has been removed from the fire, with flavoring extract or emulsion of the same flavor. Make it more zestful with a small quantity of True Lemon flavoring extract or emulsion.

MAPLE SAUCE

(To make 1 gallon)

7 lbs. granulated sugar,
2 cups of corn starch,
Carameline, to suit,
Imitation Maple flavoring extract, to taste,
True Royal Lemon extract, to taste.

Boil one quart of water. Add sugar and stir until dissolved.

Make the cornstarch into a paste free of lumps with a little cold water, and add slowly to the boiling water and sugar.

Immediately stir in enough Carameline to produce desired color, and cook three minutes.

Take from fire and at once flavor to taste with Imitation Maple flavoring extract, adding about one-quarter as much True Lemon extract.

This sauce may be used either hot or cold.

NESSELRODE SAUCE

(To make 1 gallon)

6½ pints cream, 30 per cent.
13 egg yolks,
1½ lbs. powdered sugar,
1½ oz. gelatin,
Brandy or Rum flavor, to taste.

Whip cream until stiff.

Mix egg yolks and powdered sugar, stirring lightly and stir gently into the whipped cream.

Flavor to taste with Imitation Brandy or Imitation Rum flavoring extract.

Soak the gelatin in one-half pint cold water for 5 or 10 minutes, then heat in double boiler to 160 degrees F., strain and add to mix. Cool, but do not freeze.

CHOCOLATE CHERRY SAUCE

(To make 1¼ gallons)

Make a Coa-Sauce (see formula opposite), and add to it, stirring in well, 2 lbs. of fresh or maraschino cherries cut into halves, or 3 lbs. of cold pack (2 to 1) or drained canned cherries (cut into halves). Flavor well with Imitation Cherry flavoring extract or emulsion and add a dash of Imitation Wild Cherry flavoring extract.

BRANDY SAUCE

(To make 1 gallon)

Make in same way as Rum sauce (next formula) using Imitation Brandy flavoring extract instead of Imitation Rum flavoring extract.

RUM SAUCE

(To make 1 gallon)

1 quart milk,
7 fresh whole eggs,
4 lbs. sugar,
3 quarts water,
Imitation Rum flavoring extract, to taste,
Ground nutmeg, to taste.

Beat the eggs slightly and stir them into the milk.

Add the sugar to the water and cook until it forms a moderately thick sirup. Add milk containing eggs to sirup and heat well but do not boil. Take from fire and, when nearly cool, flavor well with Imitation Rum flavoring extract. Add sufficient ground nutmeg to make a dust over surface and stir in.

Rum Sauce is best when used hot.

STANDARD HOT COCOA

½ pound Zanzibar-Brand Cocoa
1 ounce corn starch
5 pounds sugar
5 pints water

Bring the water to a boil and dissolve the starch in it. Then mix the cocoa with the sugar and add these to the water and starch.

Serve one ounce to a cup, fill with hot water and top with whipped cream or with Heller's Snow-Drift (for Fountain Use). To make a superior cocoa, use hot milk instead of hot water.

CHOCOLATE SIRUP FOR SODA FOUNTAIN

1 pound Zanzibar-Brand Cocoa
4 quarts water
8 pounds sugar

Total when finished about 1½ gallons of sirup.

Boil 2 quarts of the water, add the 1 pound of Zanzibar-Brand Cocoa; stir to a paste. Then add the remaining 2 quarts of water and the 8 pounds of sugar. Boil well and strain.

WHIPPING CREAM

Whipped Cream is an important ingredient of many of the fancy Ice-Creams, and its use in and with Ice-Cream is daily becoming more general.

All creams do not whip equally well and the same cream does not whip as readily under all conditions.

Definite facts regarding the whipping qualities of various creams and their ability to "stand up" after being whipped have been experimentally determined by the U. S. Department of Agriculture,[1] a brief summary of which follows, with occasional comment.

Powdered cream is useless for whipping purposes. Evaporated milk, while it whips readily, quickly returns to its normal condition and is therefore practically useless for whipping purposes. Neither of these products is made usable for whipping either by the addition of viscogen or by aging.

Raw cream has the best whipping qualities. Pasteurized cream with a milk or butter-fat content of 23 per cent. or more is slightly inferior for whipping to raw cream. When the milk fat content is less than 23 per cent. pasteurization is especially detrimental. Homogenization is very detrimental, and homogenizing and pasteurizing together practically destroy the whipping qualities of cream. The viscosity produced by homogenizing is not like that produced by ripening. This applies both to cream and to Ice-Cream.

Ripening improves all cream for whipping purposes, but the extent of aging required to produce best results varies with the per cent. of milk fat. In all cases nearly the maximum whip is obtained at 72 hours. This is true also of Ice-Cream ripened by storage only.

Whipping qualities increase gradually with an increase in milk-fat content up to 30 per cent. Higher milk-fat content causes no marked increase in whipping qualities. The higher the milk-fat content the quicker the cream whips and better it stands up after whipping.

Best results are obtained when the cream is kept at a temperature of 45 degrees F. or less. Temperature is an important factor in whipping and as affecting standing-up qualities. Under 50 degrees F. whipped cream will stand up for several days. As the temperature rises the stiffness decreases.

Sugar, whenever added, if used in greater quantity than 1 ounce to 4 pints, decreases the quality of the whip in proportion to the quantity used. Granulated and powdered sugar have the same effects. Flavoring extract affects neither the whipping quality nor the lasting quality of the whip.

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[1]U. S. Dept. Agric., Bulletin No. 1075,

The manufacturer who turns out much fancy Ice-Cream will find a power beater a profitable investment. Such items as marshmallows require an unreasonable expenditure of time and effort if they are to be beaten by hand. Besides, the swell of whipped goods can be more exactly regulated with a power whipper than with hand whipping.

MENU TERMS

Fr.—French; Ger.—German; It.—Italian; Sp.—Spanish.

Aufait (Fr. meaning "skilled")—Alternate layers of Ice-Cream and fresh fruits.

Bavarois glacé (Fr.)—Frozen milk posset.[1]

Bavarois glacé à la vanille (Fr.)—Frozen vanilla milk posset.[1]

Berlingozzo (It.)—Custard.

Biscuits Hollandaises (Fr.)—Kirsch-flavored bisque Ice-Cream hardened in cases and topped with water ice.

Bomb à la Bertel (Fr.)—Alternate layers Strawberry and Ginger Ice-Cream in bomb mold.

Bomb à l'Empire (Fr.)—Gooseberry Ice-Cream, dusted with chopped baked almonds, in bomb mold.

Bomb à la Violet (Fr.)—Layers of pounded fresh violets and whipped cream frozen in bomb. Garnish with candied violets.

Bomb Dahoméenne (Fr.)—Bomb lined with Chocolate Ice-Cream, Praline (burnt almond) Ice-Cream in center.

Cartouches de M. de Cupidon (Fr., meaning "Cupid's cartridges")—Chocolate Ice-Cream inside of Vanilla Ice-Cream in cartridge forms.

Charlotte à la Medices (Fr.)—Chocolate Ice-Cream molded in sponge cake, and garnished with crystallized fruit.[2]

Charlotte à la Plombier (Fr.—Plomber meaning to beat, grind or roll)—Ice-Cream inclosed in sponge cake, topped with whipped cream, ground almond dust and crystallized fruit.[2]

Charlotte à la Princesse (Fr.)—Vanilla Ice-Cream containing candied fruit, inclosed in sponge cake and covered with soft pink and white icing.[2]

Charlotte glacé (Fr.)—Vanilla Ice-Cream inclosed in sponge cake, topped with whipped cream.[2]

Charlotte Russe (Fr.)—Russian charlotte, same as Charlotte glacé.

Coupe St. Jacques (Fr. meaning "St. James Stroke")—Fruit salad in cup-shaped portion of Vanilla or Strawberry Ice-Cream, topped with whipped cream. Garnish with maraschino cherry.

Crema (It.)—Custard.

Crema ghiacciata (It.)—Ice-Cream.

Crème aux avelines (Fr.)—Filbert Ice-Cream.

Crème au caramel (Fr.)—Vanilla Ice-Cream with added caramel flavor.

Crème aux fleurs d' oranger (Fr.)—Vanilla Ice-Cream flavored with orange flower water.

Crème aux violettes (Fr.)—Vanilla Ice-Cream containing pounded fresh violets or candied violets, or merely violet flavored.

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[1]Posset is hot milk curdled with liquor, sweetened, spiced, with or without crumbled bread, cake or crackers.

[2]Charlotte is fruit, cream, ice-cream, or other confection, inclosed in a form of bread or cake.

Crème d' abricots (Fr.)—Apricot Ice-Cream.
Crème d' amandes (Fr.)—Almond Ice-Cream.
Crème d' ananas (Fr.)—Pineapple Ice-Cream.
Crème de bananes (Fr.)—Banana Ice-Cream.
Crème de café (Fr.)—Coffee Ice-Cream.
Crème de canneberges (Fr.)—Cranberry Ice-Cream.
Crème de cassis (Fr.)—Black currant Ice-Cream.
Crème de cerises (Fr.)—Cherry Ice-Cream.
Crème de chocolat (Fr.)—Chocolate Ice-Cream.
Crème de citron (Fr.)—Lemon Ice-Cream.
Crème de fraises (Fr.)—Strawberry Ice-Cream.
Crème de framboises (Fr.)—Raspberry Ice-Cream.
Crème de framboises et groseilles (Fr.)—Raspberry and Currant Ice-Cream.
Crème de gingembre (Fr.)—Ginger Ice-Cream.
Crème de groseilles (Fr.)—Currant Ice-Cream.
Crème de groseilles rouge (Fr.)—Red Currant Ice-Cream.
Crème de groseilles vertes (Fr.)—Gooseberry Ice-Cream.
Crème de marrons (Fr.)—Chestnut Ice-Cream.
Crème de mille-fruits (Fr. meaning "Ice-Cream of a thousand fruits")—Mixed Fruit Ice-Cream.
Crème de mures (Fr.)—Mulberry Ice-Cream.
Crème de mures sauvages (Fr.)—Wild mulberry Ice-Cream.
Crème de noisettes (Fr.)—Hazelnut Ice-Cream.
Crème de noix (Fr.)—Walnut Ice-Cream.
Crème de noix et pistache (Fr.)—Walnut and Pistachio Ice-Cream.
Crème d' orangers (Fr.)—Orange Ice-Cream.
Crème de pain bis (Fr.)—Brown Bread Ice-Cream.
Crème de praline (Fr.)—Ice-Cream containing powdered roasted almonds.
Crème de mandarins (Fr.)—Tangerine Orange Ice-Cream.
Crème de thé (Fr.)—Tea Ice-Cream.
Crème de thé vert (Fr.)—Green Tea Ice-Cream.
Crème de vanille (Fr.)—Vanilla Ice-Cream.
Crème en mascarade (Fr. meaning "Ice-Cream in masquerade")—Ice-Cream covered with browned meringue.
Crème glacé à la Royale (Fr.)—Pink and white Ice-Cream, molded, garnished with crystallized fruit.
Crème glacé à la Vierge (Fr.)—Bomb glacé mix flavored with liqueur or other flavoring.
Crème glacé de Plombier (Fr.)—Apricot jam on Vanilla Ice-Cream, topped with whipped cream and dusted with powdered almonds (not molded).
Crème un fruit en forme (Fr.)—Ice-Cream in fruit forms.
Crème un animal en forme (Fr.)—Ice-Cream in animal form.
Eau de cannelle (Fr.)—Cinnamon water ice.
Eau d' épine-vinette (Fr.)—Barberry water ice.
Eau de grenade (Fr.)—Pomegranate water ice.

Eau de melon (Fr.)—Melon water ice.

Where a water ice of the same name as any of the Ice-Creams listed under Crème or Glacé is made, the French name may be used merely by substituting "Eau" for "Crème" or "Glacé."

Gefrorenes (Ger.)—Frozen dessert.

Gelata alla panna (It. meaning "Frozen like bread")—Ice-Cream.

Ghiaccio Sorbetto (It.)—A frozen sherbet.

Glacé à la crème praliné (Fr.)—Ice-Cream containing powdered roasted almonds.

Glacé de muscat (Fr.)—Muscatel Grape Ice-Cream.

Glacé de pêches (Fr.)—Peach Ice-Cream.

Glacé de pistaches (Fr.)—Pistachio Ice-Cream.

Glacé de raisins (Fr.)—Grape Ice-Cream.

Glacé de rhubarbe (Fr.)—Rhubarb Ice-Cream.

Glacé de St. Gervais (Fr.)—Whipped cream sweetened, flavored and frozen, served in small cups with spoonful of cognac or brandy flavored sirup.

Glacé de tutti frutti (Fr.)—Tutti-Frutti Ice-Cream.

Glacé panaché (Fr.)—Ice-Cream of two or more colors or flavors.

Glacé au four (Fr. four meaning "oven")—Small pieces of Ice-Cream folded in paste and baked.

Glacés Napolitaines (Fr.)—Neapolitan Ice-Cream in paper cases.

Granita (It. meaning "Hard like granite")—A coarsely frozen sherbet.

Granit à la Chinoise (Fr. meaning "Granite in Chinese manner")—Coarsely frozen orange water-ice flavored with curacoa and containing candied cherries, garnished with candied orange flowers.

Granit à la Martinique (Fr.)—Apricot water ice flavored with noyan (cordial made of peach kernels), garnished with pistachio nuts.

Granit à la Republique (Fr.)—Raspberry water ice flavored with maraschino, garnished with raspberry.

Granit à la Turque (Fr.)—Coffee water ice.

Helado (Sp.)—Frozen dessert.

Helado con jugo de fruta (Sp.)—Ice-Cream with fruit juice.

Helado de crema (Sp.)—Ice-Cream.

Helado de leche (Sp., literally, "Ice-Milk," but commonly used for:)—Ice-Cream.

Melon glacé en surprise (Fr.)—Orange water ice in center of pistachio, or pineapple or ginger Ice-Cream in melon form.

Meringues à la Chantilly (Fr.)—Meringues filled with any Ice-Cream.

Mousse à la Fife (Fr. Mousse meaning "froth" or "foam")—Strawberry mousse, with green colored maraschino and rum flavored sauce, frozen in mold.

Mousse à la Kaiser (Fr.)—Liqueur flavored mousse on shredded candied orange peel, dusted with praline: that is, with chopped almonds in melted sugar.

Mousse à la Marie-Anne (Fr.)—Layers of coffee mousse, powdered praline, pineapple water-ice, and chopped candied cherries.

Mousse à la Princesse (Fr.)—Marron mousse flavored with maraschino.

Mousse au caramel (Fr.)—Caramel mousse.

Parfait à la bisque (Fr. "parfait" means "perfect" and "bisque," from bisquit, "cake")—Parfait containing maccaroons, meringue or other plain cake.

Parfait à la Japonaise (Fr.)—Maraschino flavored parfait containing brown bread crumbs, dusted with pralines.

Parfait à la Turque (Fr.)—Coffee parfait, cognac or brandy flavor.

Parfait au chocolat (Fr.)—Chocolate parfait.

Parfait aux cerises (Fr.)—Maraschino flavored cherry parfait served with compote of cherries (stewed or preserved whole cherries).

Petits soufflés glacé (Fr.)—Souffles in small paper cases.

Petits zéphyrs aux fruits (Fr.)—Little fruit souffles.

Punch à la cardinal (Fr.)—Champagne flavored orange water-ice, colored red.

Punch à la Norfolk (Fr.)—Brandy or rum flavored orange water-ice.

Punch à la Regence (Fr.)—Champagne, Martinique or arrack flavored lemon water-ice.

Punch à la Romaine (Fr.)—Rum flavored lemon water-ice.

Punch à la Russe (Fr.)—Lemon flavored green tea water-ice, with a little kümmel on it.

Rahmeis (Ger.)—Ice-Cream.

Sorbet à l'Americaine (Fr.)—Champagne flavored orange or lemon sherbet.

Sorbet à l'Egyptienne (Fr.)—Liqueur flavored orange or lemon sherbet, garnished with candied orange peel and slices of banana.

Sorbet à la Greque (Fr.)—Maraschino-flavored orange sherbet, with brandy-flavored sauce and candied ginger as a garnish.

Sorbet à l'Imperial (Fr.)—Champagne-flavored sherbet on rum-flavored pineapple sherbet.

Sorbet à la Mentone (Fr.)—Crushed apricots, bananas and tangerine oranges over rum-flavored orange sherbet.

Sorbet à la Metropole (Fr.)—Maraschino-flavored orange sherbet, sprinkled with chopped angelica, candied cherries and baked almonds.

Sorbet à la Provencale (Fr.)—Ginger and Vanilla-flavored lemon sherbet, with shredded candied fruit, and almonds.

Sorbet à la St. Charles (Fr.)—Cherry sherbet with brandy sauce.

Sorbet à la Victoria (Fr.)—Liqueur-flavored sherbet, colored pink.

Sorbette (Sp.)—Sherbet.

Sorbetto (It.)—Ice-Cream or sherbet.

Sorbetto misto or Sorbetti misti (It.)—Mixed sherbet or Ice-Cream.

Soufflé glacé à l' Alexandra (Fr.)—Apricot sherbet between layers of Chocolate Ice-Cream. Garnish with candied apricots.

Soufflé glacé à la Napolitaine (Fr.)—Maraschino-flavored orange soufflé, colored pink, green and white in layers, and sprinkled with ground almonds.

Soufflé glacé à la Princesse (Fr.)—Maraschino-flavored apricot soufflé.

Soufflé glacé à la St. George (Fr.) Maraschino soufflè over strawberry soufflé, garnished with strawberries.

Soufflé glacé à la Victoria (Fr.)—Liqueur-flavored souffle, colored green, with macedone of fruit in center.

Soufflé glacé au marasquin (Fr.)—Maraschino soufflé.

Soufflé glacé aux fraises (Fr.)—Strawberry soufflé.

Soufflé glacé panché (Fr.)—Two soufflés of contrasting colors in layers.

Zambaione—Italian custard, wine flavored.

LEGAL STANDARD FOR DAIRY PRODUCTS

Milk, Cream, Etc.

States and Territories	Milk			Cream	Skim-milk	Butter
	Milk fat or butter fat (per cent.)	Milk-solids not-fat (per cent.)	Total milk solids	Milk-fat or butter fat (per cent.)	Milk-solids not-fat (per cent.)	Milk-fat or butter fat (per cent.)
Alabama	3.25	8.50	11.75	18		80
Alaska				18		80
Arizona	3.25			18		
Arkansas				18		80
California	3	8.50		18 [1]	8.80	
Canal Zone				18		80
Colorado						
Connecticut	3.25	8.50	11.75	16		
Delaware						
District of Columbia	3.50			18		80
Florida	3.25	8.50		18	9.25 [5]	82.5
Georgia	3.25	8.50		18		82.5
Guam				18		80
Hawaii	3.		11.50	18		80
Idaho	3.20	8	[2]	18 [3]	9.35 [7]	82.5
Illinois	3.	8.50		18	9.25 [5]	82.5
Indiana	3.25	8.50			[4]	
Iowa	3.		11.50	16	[4]	
Kansas	3.25			18		
Kentucky	3.70		13			
Louisiana	3.50	8.50			8 [5]	
Maine	3.25		11.75	18		
Maryland						
Massachusetts	3.35		12.	15	9.30	82.5
Michigan	3.		12.50 [6]		[6]	
Minnesota	3.25			20 [7]		80
Mississippi	3.50	8.50		18		
Missouri	3.25	8.50		18	9.25	
Montana						80
Nebraska						
Nevada				22		
New Hampshire	3.35		11.85	18	8.50	80
New Jersey	3.		11.50	16		80
New Mexico						
New York	3.		11.50	18	8.50	80
North Carolina						
North Dakota	3.25	8.50		15 [7]		80
Ohio	3.50 [8]		12	18		80
Oklahoma				18		80
Oregon	3.20	8.50		18		80
Pennsylvania						
Philippine Islands				18		80
Porto Rico				18		80
Rhode Island	3.25		12			
South Carolina	3	8.50				
South Dakota	3.25	8.50		18	9.25	
Tennessee	3.50	8.50				
Texas						
United States inter-state c				18 [7]		80
Utah	3.20		12	18	9	80
Vermont	[9]					
Virginia	3.25	8.50		18	9.25	82.5
Washington	3.25	8.50			[4]	80
West Virginia	3.	8.50	11.50	18	9.	
Wisconsin	3.	8.50		18	9.	82.5
Wyoming	3.	8.50		18	9.25 [5]	80

LEGAL STANDARD FOR DAIRY PRODUCTS

Ice-Cream

States and Territories	Milk fat or butter fat (per cent.)	Milk-solids not-fat (per cent.)	Nut or fruit milk fat (per cent.)	Gelatin restrictions (per cent.)	Flavor restrictions (per cent.)	Color restrictions
Alabama	8[11]	10	6[10 11]			Certified[13]
Alaska	14		12		12	13
Arizona	10		14			
Arkansas	8	15	6[15]	0.5		Certified[13]
California	10		8	0.6		
California, Ice Milk [17]	2.40					
Canal Zone	14		12		12	13
Colorado	10					13
Connecticut	8[18]		6[18]			
Delaware						
District of Columbia	8				12	13
Florida	14		12		12	Certified
Georgia [19]	8		8			13
Guam	14		12		12	13
Hawaii	14		12		12	13
Idaho	14		12		12	
Illinois	8					13
Indiana	8	20		0.7		13
Iowa	12	21	10		12	Certified[13]
Kansas	10	22				
Kentucky	10	20	24			
Louisiana	10	23	8[23]	1		
Maine	14		12			
Maryland	10		8	1	12	Certified[13]
Massachusetts	7					13
Michigan	12		10	0.5	16	
Minnesota	12		10		12	13 24
Mississippi	8[25]		8	0.5	16	
Missouri	8					Certified
Montana	10	26	9[26]	1	12	13
Nebraska	14		12			13
Nevada	14		12			27
New Hampshire	14			0.2	12	13
New Jersey	8		6[28]			Certified
New Mexico						
New York	8	29				
North Carolina	8		8			
North Dakota	12		10			13
Ohio	8[31]		8	0.5		
Oklahoma	14[32]		12[32]		12	13
Oregon	10	33	8[33]	1		13
Pennsylvania	8		6		16	
Phillippine Islands	14		12		12	13
Porto Rico	14		12		12	13
Rhode Island	8			1		13
South Carolina						13
South Dakota	14		12		12	13
Tennessee	8	29	6[34]			
Tennessee, Milk-Ice	3.50	8.50				
Texas	8		6			13
United States inter-state c	14		12		12	13
Utah	14		12		12	Certified[13]
Vermont	14[35]		12[35]		12	13
Virginia	8			36	12	Certified
Washington	8	29	8[29]			13
Washington, Ice Milk [17]	2.40			0.6		13
West Virginia	8		37	0.7		Certified[13]
Wisconsin	12[38]		10[39]	0.5	12	13
Wyoming	10					Certified[13]

[1]In California there must be "not more than 8 per cent. of milk-solids-not-fat in cream containing 18 per cent. milk fat and correspondingly less solids for greater percentage of milk fat."

[2]Whole milk must have a specific gravity of 1.029 at 60° F., and a pint of milk must weigh "1 lb. strong."

[3]Acidity of cream limited in Idaho to 0.25 per cent.

[4]Skim milk is any milk below the legal standard of whole milk.

[5]Milk solids.

[6]In Michigan milk must have a specific gravity (at 60° F.) of between 1.029 and 1.033, and skim milk must have a specific gravity (at 60° F.) of between 1.032 and 1.037.

[7]Must not contain more than 0.2 acidity in terms of lactic acid.

[8]In Ohio "whole milk" must contain at least 3 per cent. milk fat and "standard milk" must contain 3.5 per cent. milk fat. Each must bear a label stating its name and percentage of milk fat.

[9]Milk and cream must not be treated with chemicals.

[10]Ice-Cream in Alabama must contain 31 per cent. total solids. Alabama law allows such reduction of milk fat for eggs, fruit, fruit juice, cake, confectionery, cocoa, chocolate, and nuts, as may be due to the addition of such ingredients, but not below 6 per cent.

[11]There appear to be two standards for Ice-Cream in Alabama. Art. 6, Sec. 10 of the Agricultural law of 1923 fixes the standard given above and declares Ice-Cream below that standard adulterated. Art. 5, Sec. 5 of the same act directs "The State Board of Agriculture, with the assistance of the State Chemist, to fix the standards of purity for all food and drug products, in accordance with" Federal Standards for Ice-Cream; to wit, 14 per cent. milk fat for plain Ice-Cream and 12 per cent. milk fat for Fruit and Nut Ice-Creams.

[12]Natural.

[13]Coloring. "whereby damage or inferiority is concealed" or the product "is made to appear better or of greater value than it really is," is prohibited.

[14]Total solids required in Arizona, 30 per cent.

[15]In Arkansas, Ice-Cream, both plain and with fruit and nuts, must contain 32 per cent. total solids.

[16]True to name.

[17]Ice milk is made of "pure sweet milk and sugar."

[18]Other standards may be made if marked and tagged.

[19]Regulations governing milk and milk products of the Georgia Department of Agriculture (No. 5 par. 16) forbids the sale of Homogenized frozen milk products in Georgia as "ICE-CREAM" except when branded or labeled "Homogenized Frozen Milk Products."

[20]Total milk solids required, 18 per cent.

[21]Acidity of Ice-Cream in Iowa must not exceed 0.3 per cent.

[22]Ice-Cream in Kansas must contain 20 per cent. total milk solids and must weigh 4¾ lbs. per gallon.

[23]Fruit and Nut Ice-Cream must contain 18 per cent. total milk solids in Louisiana: other Ice-Cream must have 20 per cent. total milk solids.

[24]No added color in plain Ice-Cream. No coal dye colors.

[25]Ice-Cream is defined in Mississippi as "The frozen product made from cream, milk and sugar, with or without a normal flavoring." Any other frozen product "shall be designated and sold as sherbet or water ice." Use of lime as neutralizer is prohibited.

[26]Ice-Cream must contain not less than 33 per cent. total solids.

[27]Is deemed adulterated if colored "so as to deceive, mislead or tend to deceive the purchaser."

[28]Ice-Cream containing nuts, fruit or eggs must contain not less than 6 per cent.

[29]Ice-Cream must contain 18 per cent. total milk solids.

[30]Use of added mineral color, aniline dye or other coal tar dye prohibited. Name of harmless vegetable dye or color, if used, must be on label, except of those products exempted by the Food Commissioner.

[31]Acidity of Ice-Cream may not exceed 0.3 per cent. in Ohio. Cream used in it must not be neutralized. The finished Ice-Cream must weigh at least 4½ lbs. per gallon.

[32]Regulation 41 in Food and Drug Bulletin of August, 1923, of the Oklahoma State Dept. of Health, provides skimmed milk and butter fat passed through a homogenizer or an emulsifier, are not entitled to the name of milk or of cream, as the case may be. Products made of them cannot properly be called Ice-Cream. The use of such products in Ice-Cream is prohibited. The sale of such products is prohibited.

[33]Fruit and Nut Ice-Cream must contain 18 per cent. total milk solids. Other Ice-Cream must contain 20 per cent. total milk solids. The acidity of Ice-Cream must not exceed 0.3 per cent.

[34]Ice-Cream containing eggs, fruit, fruit juice, cake, confectionery, cocoa, chocolate, or nuts may have "such reduction of the percentage of milk fat and milk-solids-not-fat as may be due to the addition of such ingredients," and must contain at least 6 per cent. milk fat and 16 per cent. milk solids.

[35]Container for Ice-Cream in which there is condensed milk or condensed skim milk must be marked "Made with condensed (skim) milk."

[36]Gelatin not to exceed 4 oz. to each 10 gallons of finished Ice-Cream.

[37]Where eggs, fruit, nuts, chocolate or cake are added "such reductions in the percentage of milk fat and milk-solids-not-fat shall be allowed as may be caused by the addition of such ingredients."

[38]Includes plain Ice-Cream and Orange, Lemon and Wintergreen Ice-Cream. Swell allowed, 100 per cent.

[39]Includes Fruit, Nut, Cocoa, Chocolate, and Caramel Ice-Cream, and Maple Ice-Cream containing maple sugar or maple sirup. Swell allowed, 100 per cent.

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B. HELLER & COMPANY'S

MELOINE

Makes Ice Cream Smooth and Velvety

MELOINE ripens and puts the mix in proper condition for freezing. It thickens the mix for proper swell without the need of decomposing and partly souring it by aging. It makes it possible to produce an Ice Cream of proper texture and resistance, with the bloom of fresh milk and cream.

MELOINE saves time, refrigeration, space, and a large part of the equipment of cans and storage vats. Though it ripens in 2 to 10 hours, it does it better than storage ripening or aging does in 2 to 4 days. The table on page 72 gives exact time.

MELOINE increases overrun and improves the dishing quality. It is deliberately mild in action.

MELOINE makes Ice Cream more wholesome. By making long aging unnecessary, it holds down bacterial growth and so prevents the decomposition, fermentation, "off flavors" and odors due to them.

MELOINE is economical and easy to use—never more than an ounce to every ten gallons of finished Ice Cream. It requires neither cooking nor heating.

MELOINE is packed in 10-pound cans.

Write us for current price list.

B. HELLER & COMPANY'S

MELLO-FREEZE

A Quickly Soluble Ice Cream Improver

Mello-Freeze—The action of Mello-Freeze on the Ice Cream Mix is very similar to the action of Meloine (see opposite page), except that it goes into solution quickly. Without preparing a stock solution, it can be stirred into a little cold water and used at once.

Mello-Freeze (like Meloine) is an improver which serves economy. It costs about ¼-cent per gallon of finished Ice Cream. It is efficient in action, effective in results, and economical in reducing overhead costs.

Mello-Freeze (like Meloine) makes Ice Cream mellow and smoother, making it unnecessary to use an unduly high percentage of milk solids for that purpose. It thickens the mix for a more lasting swell. The table on page 72 gives the exact time needed for ripening with Mello-Freeze, as well as with Meloine.

Mello-Freeze is packed in 10-pound cans.

Write us for current price list.

B. HELLER & COMPANY'S

SNOW

(REG. U. S. PAT. OFF.)

IMPROVES
ICES AND SHERBETS

SNOW gives texture, smoothness, and stability to simple fruit ices, water ices, and sherbets. It tends to absorb the moisture of the mix that would otherwise be frozen into coarse, icy crystals, and so gives added value to the many types of frozen dainties sold under various trade names, such as suckers, etc., as well as to the usual ices and sherbets.

SNOW keeps the solids in even distribution. It prevents the formation of a sirupy mass of flavor and color in the bottom of the can, and prevents coarse, flavorless ice spines at the top. It makes ices and sherbets uniform from top to bottom, till used.

SNOW makes possible the commercial production and safe shipment of ices and sherbets. Properly frozen and hardened, Snow sustains them through truck and express hauls and through the trying conditions of service cabinets. It opens a more profitable field at insignificant cost. It is easy to use and requires no heating.

SNOW is packed in 350-pound barrels, and 10-pound cans.

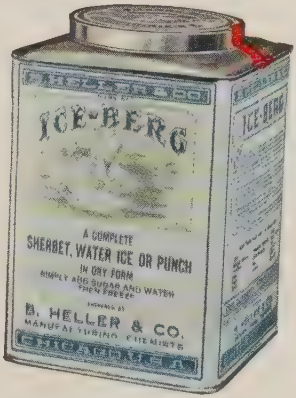
For quotations, see current price list.

NOTE—We also manufacture a Complete Water Ice in Dry Form, known as Ice-Berg. See opposite page.

B. HELLER & COMPANY'S

ICE-BERG

(REG. U. S. PAT. OFF.)



READY MADE DRY MIX

for

Ices, Sherbets, Granites, Frappes, Souffles and Punches

B. Heller & Company's Ice-Berg contains all the ingredients necessary, except sugar and water, for making fine Water Ices, Sherbets, Frappes Etc. It is scientifically compounded, colored, and flavored, so that the product is always standard and always good. There is no guess-work and no variation. Directions on every package.

Ice-Berg is a time saver and an economy for the busy caterer and chef and enables the ice cream maker to produce, at short notice, fancy Ices, Sherbets and Punches that will delight the most exacting. It provides, at a cost of less than a cent for a generous helping, the various frozen desserts which make profitable prices possible in exclusive dining rooms. When using Ice-Berg the day's product can be changed to suit any demand and it will be unsurpassed for appearance, flavor, and ability to "stand up."

B. Heller & Company's Ice-Berg is made in the following delicious flavors:

Lemon, True
Pineapple, Imitation
Strawberry "
Grape "
Peach "
Apricot "

Champagne, Imitation
Creme-De-Menthe "
Rum, "
Anisette "

Orange, True
Cherry, Imitation
Lime "
Raspberry "
Apple "
Watermelon "

Ice-Berg is packed in 350-pound barrels, and 10-pound cans.

Write us for current price list.

B. HELLER & COMPANY'S

ZANZIBAR-BRAND

(Reg. U. S. Pat. Off.)

COCOA

DEEP COLOR
HIGHEST SOLUBILITY
RICH IN FLAVOR

Zanzibar-Brand Cocoa, for purity, flavor, color and aroma, is beyond all doubt, one of the finest qualities ever offered to the manufacturer of Ice-Cream. It is a pure Cocoa, improved with various processes to give it a rich, fragrant flavor and aroma which remain after due freezing and hardening. It is made deep in color without the use of alkalis or other darkening chemicals. It is smooth, creamy, and blends delightfully with the vanilla mix in which it is used or over which it is poured as a sauce. A layer of it in an Ice-Cream brick blends perfectly with other flavors and stands out beautifully in color. The color as drawn from the freezer, deepens two shades in hardening.

Zanzibar-Brand Cocoa has enough of the vegetable fat removed to make the Cocoa suitable for efficient use in chocolate Ice-Cream made of regular vanilla mix. It has ample cocoa butter for smoothness and has the actual flavoring and coloring elements undiminished. It is a scientifically adapted cocoa for standardized commercial Ice-Cream.

Many Ice-Cream Manufacturers now realize that chocolate and chocolate liquor are not as desirable for Ice-Cream as a high quality of Cocoa, as they very often cause black specks, and do not mix satisfactorily. If enough of either is added to the regular vanilla mix to produce the proper flavor and color, it necessarily introduces with it an excess of cocoa butter. This vegetable fat cannot be calculated as butter fat and adds nothing to the flavor or color: it does add to the bulk of the mix to such an extent that the butter fat content of the regular vanilla mix is reduced to that extent below the legal standard.

Zanzibar-Brand Cocoa used according to the formulas in this book, produces the highest perfection of chocolate Ice-Cream known to the trade, and does it profitably. For hot cocoa and other fountain use, it is unexcelled. Sealed to guard against substitution, in 200-pound drums; 100, 50, 25 and 10-pound cans.

FOR QUOTATIONS, SEE CURRENT PRICE LIST

B. HELLER & COMPANY'S

ROYAL ZEST COCOA

With

Milk, Malt and Sugar

For Instantaneous Hot Cocoa
Ready Mixed, in Powder Form

Packed in Individual Portions or in Bulk

Add Hot Water and Serve

ROYAL ZEST COCOA WITH MILK, MALT AND SUGAR is put up to insure perfect proportions of all ingredients in each cup of hot cocoa. The prepared combination consists of a high quality of cocoa, milk powder, concentrated malt extract, and cane sugar, skillfully blended and scientifically balanced. While the dominating taste is that of a delicious chocolate drink, there is an indefinable something else which brings the customer back for more and more. It is smooth, creamy, pure, wholesome, and nourishing, a food as well as a beverage.

ROYAL ZEST COCOA WITH MILK, MALT AND SUGAR is packed both in bulk and in individual sanitary bags, each bag containing the "makings" of one cup of delicious hot cocoa of average strength. In bulk, it is packed with a small dipper holding exactly one ounce, enough to make a cupful.

In either style of packing, the possibility of error, variation and uncertainty is removed, there is no waiting for the drink to be compounded, and profits are on a definite basis.

WRITE US FOR CURRENT PRICE LIST.

In cartons it is packed 100 individual bags to the carton. In bulk it is packed in 275-pound drums; 125, 60, 30, and 10-pound cans.

B. HELLER & COMPANY'S

Zanzibar-Brand
COA-SAUCE

Reg. U. S. Pat. Off.

A Delicious Cocoa Sirup in Powder Form.

DILUTE WITH WATER OR MILK

Dressing for Sundaes
Sirup for Sodas
Flavor for Malted Milk

Zanzibar-Brand Coa-Sauce produces a smooth, thick and delicious sirup for all fountain use demanding chocolate or cocoa. It is a complete product in itself—simply dilute in hot water according to instructions and use.

It is the base of excellent sodas: it makes delicious sundaes and gives class and distinction to malted milk, making a smooth, and rich product of pleasing flavor, aroma, and depth of color.

It makes a distinctly superior flavoring sirup which lacks the crude harshness of ordinary prepared sirups. It stimulates sales wherever it is used and has proven itself an economical retail business builder of the highest order.

Zanzibar-Brand Coa-Sauce can be dissolved in either milk or water, in any desired strength.

It is packed in 200-lb. drums, and 100, 50, 25 and 10-lb. cans.

For quotations, see current price list.

B. Heller & Company's

Frapine

Reg. U. S. Pat. Off.

Gives
Smoothness and Creaminess
to Malted Milk Drinks

Frapine brings repeat orders for malted milk. Without it, malted milk, however palatable at first, soon surfeits the taste: it no longer tempts, and even repels. Frapine gives new zest and attraction to the drink at every glassful, so that the consumer does not tire of it. The smooth, cream-like texture of malted milk made with Frapine pleases the most discriminating. The more they drink of it the better they like it.

Frapine does not add to the cost of the material in the malted milk. It displaces an equal volume in the stock mix, and the same total quantity is used in mixing the drink with Frapine as without it.

The profits of the soda counter are in the volume of trade. Frapine brings volume of sales to a profitable drink.

It is packed in 350-lb. barrels, and 10-lb. cans.

Write for current price list.

HELLER'S

Snow-Drift

(Trade-Mark Registered)

To Be Used Instead of Whipped Cream or Meringues

As an ingredient of bisque and bisquit ice creams, parfaits, mousses and whips, Heller's Snow-Drift has a fluffy, rich appearance not surpassed by costly, whipped cream. It has the body and strength of whip to resist the crushing effect of other ingredients.

As a topping for ice cream sodas, sundaes, frozen charlotte russe, malted milk, and hot chocolate and coffee, Heller's Snow-Drift is more economical, less troublesome and more enduring than whipped cream.

Heller's Snow-Drift is pure, imparts no sour or "off flavors" and is always ready for use. When Snow-Drift has been kept for several days, and is even partly liquefied, it can be easily re-whipped, and completely restored. It has body enough to "stand up" without the addition of gelatin solution. It is therefore cheaper, more practical, and easier to use than whipped cream.

Caterers and Soda Fountains find Heller's Snow-Drift a convenience at all times and a necessity where good 30 to 40 per cent, whipping cream is not available.

It is packed in 5 and 15-pound cans; and in bulk in 250 pound barrels.

For quotations, see current price list.

DELICIOUS
VANHELLER

(REG. U. S. PAT. OFF. AND IN CANADA)

Costs Less Than Vanilla
Goes Farther
Gives Greater Satisfaction

Vanheller is a vanilla-like flavor, made expressly for Ice-Cream. It is the first choice of thousands of Ice Cream Manufacturers and it will also be your first choice, after you have tried it. Many manufacturers give Vanheller credit for big increases in their sales on Ice-Cream —It will also increase your sales. The delightfully mellow vanilla-like flavor that it imparts to Ice-Cream appeals to all.

Vanheller is a Better Flavor—it goes much further—it is economical—in fact it is the flavor you have been looking for.

The flavoring principle in Vanheller is absolutely pure and guaranteed not to contain the resins contained in vanilla extract.

Vanheller is packed in 50-gallon oak barrels, 25-gallon half-barrels, 15-gallon kegs; and 1-gallon bottles.

Write us for current price list.

B. HELLER & COMPANY'S

Ice Cream Makers' Friend

(REG. U. S. PAT. OFF.)

IN LIQUID FORM

Ice Cream Makers' Friend is a very popular Ice-Cream flavor resembling vanilla extract. It is a reliable, and economical article of pleasing flavor and aroma. It has exceptional strength, and is not appreciably affected by low temperatures.

Although we recommend Vanheller (see page 429) as first choice, in the way of a vanilla-like flavor, many of our customers feel as though they would not care to use any flavor other than Ice Cream Makers' Friend. The particular blend of flavoring and aromatic properties used in this article has made a decided appeal to its users. In fact we can safely say, without hesitancy, both the Ice Cream Makers' Friend and Vanheller are conceded to be exceptional flavors.

It is packed in 50-gallon barrels, 25-gallon half-barrels, 15-gallon kegs, and 1-gallon bottles.

B. HELLER & COMPANY'S

Ice Cream Makers' Friend

(REG. U. S. PAT. OFF.)

IN DRY FORM
(Not a Vanilla Sugar)

COMPLETELY SOLUBLE
HIGHLY ECONOMICAL

Ice Cream Makers' Friend, in dry form contains all the flavoring of the liquid form, without the alcohol. It is a practical flavor for those wanting a flavor in dry form. For Ice Cream the required quantity may be mixed well into a pint or quart of the ice cream mix and then added to the full batch, or the powder may simply be added to the mix in the tank and stirred in.

It is packed in 10-pound and 1-pound cans.

FOR QUOTATIONS, SEE CURRENT PRICE LIST.

B. HELLER & COMPANY'S

ZANZIBAR-BRAND
Reg. U. S. Pat. Off.

VANILOID

A DELICIOUS VANILLA-LIKE FLAVOR EXTRA STRONG

Zanzibar-Brand Vaniloid is a careful blending of various flavoring and aromatic properties combined in such a manner as to produce a mild and pleasing flavor which will not overpower the bloom of fresh dairy products in Ice Cream.

Vaniloid can be reduced to any desired strength by the simple addition of water. A pint will make from one to two gallons of flavoring. If left undiluted, it is well to first dissolve the flavor in a quart of the mix and then to stir it into the rest.

Vaniloid is efficient and economical. It saves in transportation charges and storage space.

Vaniloid is packed in 1-gallon and 1-pint bottles.

Write us for current price list.

HELLER'S

Van-Bouquet

Reg. U. S. Pat. Off.

A Powerful Vanilla-Like Flavor

In Barrels and Kegs Only
Not Sold in Bottles

Heller's Van-Bouquet is an economical ice cream flavor for large operations, It has strength, rich flavor and pleasing aroma. It endures extremes of temperature even better than vanilla extract.

Heller's Van-Bouquet is especially valuable in masking "off" flavors and odors, such as may be caused by milk with "cooked" flavor, by pasteurizing at high temperatures, or by the use of milk products with weedy or objectionable flavor.

It is packed only in 50-gallon barrels, 25-gallon half-barrels and 10-gallon kegs.

HELLER'S

Van-Bouquet

Reg. U. S. Pat. Off.

Extra Strength

In One-Gallon Bottles Only

Heller's Van-Bouquet, Extra Strength is like the preceding except that it is much stronger. By simply diluting it with water, each pint will make from one to two gallons of delicious flavoring.

Heller's Van-Bouquet, Extra Strength saves transportation charges and storage space. It makes for greater efficiency.

For quotations, see current price list.

ZANZIBAR-BRAND

U-Combine

No. 1 & No. 2

Reg. U. S. Pat. Off.

IMITATION VANILLA EXTRACT

Vanilla-Like Flavor in Two Bottles; Combine to Suit Ingredients of Mix.

By mixing U-Combine No. 1 and No. 2 the Ice Cream Maker may produce the VANILLA-LIKE FLAVOR best suited to his needs. In other words, we place him in a position to make HIS OWN BLEND—HIS OWN FLAVOR. This new and modern idea will appeal to practically every concern that uses Vanilla, or Vanilla-like flavors.

U-Combine is compounded in two separate containers and called U-Combine No. 1 and U-Combine No. 2. It takes part of the contents of each bottle to make a completed flavor.

The No. 1 and No. 2 U-Combine, are simply mixed together in the proportions decided upon by the Ice Cream Maker. These proportions can be regulated in such a way as to produce most any desired flavor, of a Vanilla-like nature.

U-Combine No. 1 is the exrreme in the way of strength, pungency etc., while U-Combine No. 2 is the extreme in the way of a smooth, mild, and mellow mixture. This fact together with the further fact that the No. 1 and No. 2 contain every item that is used in producing a Vanilla-like flavor, explains just why the customer can make any blend he desires. U-Combine is different—it fills a long felt want, not satisfied heretofore by the use of Vanilla Extracts and ready-made compounds. It is blended by the customer, to suit his individual idea of a satisfactory flavor.

Neither the No. 1 nor No. 2 U-Combine, constitute a completed blend. Both are necessary to a finished product.

Where "off" flavors or odors must be masked, such as may be caused by milk with a "cooked" flavor, by pasteurizing at high temperatures, or by the use of milk products with weedy or objectionable flavors, use a greater proportion of U-Combine No. 1 than No. 2.

EVEN THOUGH ANOTHER BRAND OF FLAVOR IS USED, every ice cream plant should have the U-Combine pair at hand for use in an emergency when the customary formula is changed.

It is packed only in 1-gallon bottles.

Write for current price list.

B. HELLER & COMPANY'S

$1000.00 GUARANTEED PURE

Vanilla Extract

For Quality and Economy

Heller's $1000.00 Guaranteed Pure Vanilla Extract is obtained from vanilla beans especially selected for uniform standard of quality and strength.

Thoroughly aged and mellowed (like all our vanillas), it has the characteristic, pleasing flavor and aroma of pure vanilla without any artificial flavoring or coloring matter whatever. It has built up its popularity entirely on its own intrinsic merit.

Heller's $1000.00 Guaranteed Pure Vanilla Extract is a pure vanilla extract (at moderate cost) that will stand the quality and uniformity tests of the careful buyer.

It is packed in 50-gallon Oak barrels, 25-gallon half-barrels, 15-gallon kegs; and 10-gallon bottles.

For quotations, see current price list.

B. HELLER & COMPANY'S

ICE CREAM MAKERS' SPECIAL

TRADE-MARK REG.

Vanilla Extract

GUARANTEED PURE

FOR SUPERIOR ICE CREAM

Heller's Ice Cream Makers' Special Vanilla Extract is obtained by our own method from vanilla beans specially selected for use in ice cream and other frozen desserts.

It imparts a mellow, delicately fragrant flavor and aroma.

Heller's Ice Cream Makers' Special Vanilla Extract has, for many years, enjoyed special popularity among the makers of high grade ice cream who desire a pure vanilla extract of extra strength and flavoring ability.

It is packed in 50-gallon Oak barrels, 25-gallon half-barrels, 15-gallon kegs; and 1-gallon bottles.

Write us for current price list.

B. Heller & Company's

XXXX BRAND

Trade Mark Reg.

GUARANTEED PURE

Vanilla Extract

For Select Trade

Heller's XXXX-Brand Vanilla Extract is obtained from ripened, correctly cured, and carefully selected vanilla beans of highest quality. No expense is spared in producing and aging this extract to meet the exacting requirements of those who are accustomed to the best.

It has that rich, mellow, fragrant and lasting aroma which insures its economy in use (and its ability to endure through extremes of temperature); and yet it has that delicate refinement of flavor which delights the caterer and captures the epicure. It is a business builder, a dignified advertisement which places a product on heights of superiority that are above the pretensions of competition.

Heller's XXXX-Brand Vanilla Extract is the last word in distinctively exquisite flavoring.

It is packed in 50-gallon Oak barrels, and 1-gallon bottles.

FOR QUOTATIONS, SEE CURRENT PRICE LIST.

B. HELLER & COMPANY'S

ICE CREAM BOUQUET

Reg. U. S. Pat. Off.

A Vanilla, Vanillin and Sugar Preparation

Pure and Wholesome

Heller's Ice Cream Bouquet is a dry-powder vanilla flavor consisting of carefully selected vanilla beans, ground to extra fineness, fortified with added vanillin, on a cane sugar base. Costly alcohol is entirely omitted.

The use of vanilla in this form is old and tried. It is an inexpensive way of obtaining the characteristic flavor of true vanilla and the added vanillin gives it greater flavoring power. Those who are partial to the use of vanilla sugar for flavoring, recognize the delicate and distinctive flavor of Ice Cream Bouquet, due to our own scientific method of blending and processing.

Heller's Ice Cream Bouquet keeps perfectly in its container, and is readily miscible. It is so completely taken up by the mix that it leaves no specks or streaks. The mix is, in effect, as if flavored with vanilla extract. Its use is as simple as the use of extracts and other flavorings.

It is packed in 5-pound cans.

Write us for current price list.

B. HELLER & COMPANY'S

Zanzibar-Brand

REG. U. S. PAT. OFF.

Imitation

Maple Flavor

Pleasing, Wholesome, Strong

Zanzibar-Brand Maple Flavor is a sales-builder for the Ice Cream Manufacturer. The smooth, delightful flavor that it imparts to the finished Ice Cream, appeals to the public, in general, and its strength makes it economical to use. It is obtained from choice, carefully selected materials. We feel safe in saying that you will prefer it to anything you have ever used in flavoring your Maple Ice Cream, etc.

It is not practical to flavor a frozen product satisfactorily with maple sugar or maple sirup without destroying that balance of ingredients which makes the mix properly controllable and which causes the frozen product to harden and "stand up" in a normal manner. The use of Maple Flavor is therefore a necessity.

It is suitable for Ice Creams, Ices, Panache, Parfait, Sauce, and Sirup.

It is packed in 50-gallon barrels, 25-gallon half-barrels, 15-gallon kegs; and 1-gallon bottles.

For quotations, see current price list.

B. HELLER & COMPANY'S

ZANZIBAR-BRAND

(REG. U. S. PAT. OFF.)

Special Flavors

For Sauce and Frozen Punches

Sold Only for Use in Recipes Not for Resale

Owing to Prohibition, it has become a problem to flavor certain frozen puddings, punches and sauces correctly and palatably. Under the need of the hour, we have perfected certain flavors to take the place of liquors in frozen desserts which have always required them.

Zanzibar-Brand Special Flavors meet the most exacting requirements of the trade. They are strong and should be used most sparingly. They impart an appetizing, zestful flavor, almost that of genuine liquor.

Put up in the following flavors.

Brandy Flavor, Imitation
Anisette Flavor, Imitation
Champagne Flavor, Imitation
Rum Flavor, Imitation

Packed in gallon, half-gallon, quart, and pint bottles.

Write us for current price list.

B. HELLER & COMPANY'S

Royal (True)

Orange and Lemon Extracts

For
Ice Cream, Ices and Sherbets

Royal Orange Extract and Royal Lemon Extract are particularly adapted to all sorts of frozen desserts and frozen confections, giving them a delicious, fruity flavor, free of the bitter, turpentine-like after-taste that mars so many products.

In three-layer bricks, custom has made a pleasing layer of orange ice a practical necessity. Give it the desired flavor with true Royal Orange, color it with our Navel Orange Shade Yellow dry or liquid color, and it will blend perfectly with the layers of vanilla, chocolate or other flavors used.

Royal Orange and Royal Lemon make it possible to produce water ices, fruit ices and sherbets that are preferred to costlier ice creams. When used in ice creams according to formulas in this book, they offer a delightful novelty to draw new trade.

Packed in 50-gallon barrels, 25-gallon half-barrels, 15-gallon kegs; and gallon, half-gallon, quart, and pint bottles.

For quotations, see current price list.

B. HELLER & COMPANY'S
ZANZIBAR-BRAND
(REG. U. S. PAT. OFF.)
FLAVORING EXTRACTS

Economical Because Stronger

For Ice Cream, Ices and Sherbets

ZANZIBAR BRAND FLAVORING EXTRACTS sell frozen products because they enable you to reproduce the flavor of fruits. They are made of carefully selected materials, painstakingly compounded, uniform in flavor and strength, put up in light-proof containers, amber bottles or oak barrels, half-barrels and kegs. They are harmless and comply with the National Pure Food Law.

ZANZIBAR-BRAND FLAVORING EXTRACTS are made in sufficient variety to cover all needs, They are very strong: use them most sparingly.

Almond (Bitter), True
Anisette, Imitation
Anise, True
Apple, Imitation
Apricot, Imitation
Banana, Imitation
Blackberry, Imitation
Brandy, Imitation
Butter, Imitation
Cassia (Cinnamon) True
Champagne, Imitation
Cherry, Imitation
Cherry, (Wild) Imitation
Cloves, True
Currant, Imitation
Grape, Imitation
Ice Cream Makers' Friend
Lemon, (Royal) True
Lime, True
Muskmelon, Imitation
Orange, (Royal) True
Orange (Mandarin) Imitation
Peach, Imitation
Pear, Imitation
Peppermint, True
Pineapple, Imitation
Pistachio, Imitation
Plum, Imitation
Raspberry Imitation
Roman Punch, Imitation
Rose, Imitation
Rum, Imitation
Sassafras, True
Strawberry, Imitation
Tutti-Frutti, Imitation
Van-Bouquet
Van-Bouquet, Extra Strength
Vanheller
Vaniloid
Vanilla, Pure I. C. M. Special
Vanilla, Pure $1000 Guaranteed
Vanilla, Pure XXXX
Violet, Imitation
Walnut, Imitation
Watermelon, Imitation
Wintergreen, True

Packed in 50-gallon barrels, 25-gallon half-barrels, 15-gallon kegs; and gallon, half-gallon, quart and pint bottles.

Write us for current price list.

B. Heller & Company's

Flavoring Emulsions

For
Ice Cream, Ices and Sherbets
Most Economical

The high cost of alcohol made it desirable to put up flavorings without it, if that could be done without sacrificing any of the virtues of flavoring extracts, and so reduce the cost of flavor to the ice cream maker. This was accomplished and perfected in Heller's Flavoring Emulsions.

Heller's Flavoring Emulsions have the same flavoring principles as our flavoring extracts and they comply with the Federal Pure Food Law. Low temperatures do not affect the Emulsions.

Packed only in sealed one-pound glass jars, they are prepared in the following flavors.

Almond,
Anise,
Banana, Imitation
Blackberry, Imitation
Cherry, Imitation
Cloves,
Currant, Imitation
Grape, Imitation
Lemon,
Lime,
Maple, Imitation
Maraschino, Imitation
Orange,
Peach, Imitation
Peppermint,
Pineapple, Imitation
Pistachio, Imitation
Raspberry, Imitation
Strawberry, Imitation
Sassafras,
Tutti-Frutti, Imitation
Wintergreen,

FOR QUOTATIONS, SEE CURRENT PRICE LIST.

B. HELLER & COMPANY'S

ZANZIBAR-BRAND
(REG. U. S. PAT. OFF.)

True Coffee
Flavoring Paste

For Coffee Ice Cream and Coffee Ice

Zanzibar-Brand True Coffee Paste contains a choice blend of fine coffees, roasted, ground to great fineness, and formed into a paste by an original process without the use of alcohol. It produces a rich, aromatic frozen dessert that is relished by those who are fond of good coffee. Its use in ice cream is not new; but in frozen puddings and in a special water-ice given in this book, it furnishes a novelty which finds many devoted friends.

Zanzibar-Brand True Coffee Paste requires neither cooking nor heating to bring out the flavor and mixes readily in the ice cream mix and in ices. It contains no alcohol and is therefore a low-priced profitable flavor to use. It is not affected by the extreme cold of freezing and hardening.

Zanzibar-Brand True Coffee Paste is self coloring (that is, it contains no added color) and complies with all pure-food laws.

It is packed in 350-pound barrels, and 5-pound cans.

Write us for current price list.

B. Heller & Company's

MALABOZA

Caramel-ine

Reg. U. S. Pat. Off.

Combined Coloring and Flavoring Paste

Heller's Malaboza Caramel-ine, is a caramel, fortified with a blend of various vegetable flavors, which enables it to impart a rich, delicious and distinctive flavor to ice creams, frappés and sauces.

Heller's Malaboza Caramel-ine is dependably uniform and lends itself admirably to standardized use. The quantity of Caramel-ine which gives the desired flavor will produce the correspondingly correct shade of color. Conversely, the quantity which gives the desired depth of color will produce the correspondingly correct intensity of flavor.

Heller's Malaboza Caramel-ine is non-alcoholic. Neither color nor flavor is affected by freezing and hardening. It complies with all pure food laws.

It is packed in 350-pound barrels, 175-pound half-barrels, and in 5-pound cans.

For quotations, see current price list.

B. HELLER & COMPANY'S MALABOZA

Reg. U. S. Pat. Off.

Pure Food Colors

IN DRY FORM

Harmless and Powerful

Heller's Malaboza Dry Food Colors are made in accordance with the provisions of Federal Pure Food Laws and Regulations. Colors that have been certified for harmlessness to the U. S. Government are combined to suit the special requirements of the freezer, hardening room and service cabinet. They are absolutely harmless and enduring.

Whether Heller's Malaboza Dry Food Colors are used strong enough for the deeper shades of color or reduced to mere suggestions of delicately pale tints, the result is always a clear color. These colors are readily soluble and leave no taste or odor.

Heller's Malaboza Dry Food Colors are available in the following colors. The key for the corresponding flavors is on pages 100-101 of this book.

No. 100	Strawberry Shade Red
No. 101	Raspberry Shade Red
No. 102	Cherry Shade Red
No. 106	Imperial Dark Red (for striping)
No. 107	Carminine Light Red
No. 108	Cardinal Dark Red
No. 121	Brilliant Rose Shade Pink
No. 122	Cherry Blossoms Shade Pink
No. 131	Lemon Shade Yellow
No. 135	Banana Shade Yellow
No. 137	Yolk-Em Egg Shade
No. 138	Navel Orange Shade
No. 151	Mandarin Orange Shade
No. 153	Blood Orange Shade
No. 161	Pansy Shade Violet
No. 162	Riverside Violet Shade
No. 164	Heliotrope
No. 171	Clover Leaf Shade Green
No. 172	Pistachio Shade Green
No. 174	Creme-De-Menthe Shade (Green)
No. 183	Chocolate Shade Dark Brown
No. 185	Caramel Shade Brown
No. 186	Maple Shade Brown
No. 191	Damson Shade Blue
No. 192	Ocean Shade Blue
No. 197	Jet Black

The colors are packed in 50-pound, 25-pound, 10-pound, 5-pound 1-pound; 8-ounce and 4-ounce cans.

Write for current price list.

B. Heller & Company's

Malaboza

Reg. U. S. Pat. Off.

Pure Food Colors

IN LIQUID FORM

Especially Suitable for Ice Creams, Ices and Other Frozen Desserts.

Heller's Malaboza Liquid Food Colors are various combinations made from colors that have been tested, passed and certified harmless to the U. S. Department of Agriculture. They leave no taste or odor of themselves.

They are economical to use, imparting a brilliant, natural color, capable of being diluted to any degree of intensity to suit the fruit or other corresponding flavor to be matched. The key for the conventional colors to accompany various flavors will be found on pages 100-101 of this book. Prepare a standard for exact matching and measure out the exact quantity required to color a batch of a given size to the exact shade.

Heller's Malaboza Liquid Food Colors are available in the following colors.

No. 300 Strawberry Shade Red
No. 301 Raspberry Shade Red
No. 302 Cherry Shade Red
No. 306 Imperial Dark Red (for striping)
No. 307 Carminine Light Red
No. 308 Cardinal Dark Red
No. 312 Brilliant Rose Shade Pink
No. 322 Cherry Blossom Shade Pink
No. 331 Lemon Shade Yellow
No. 335 Banana Shade Yellow
No. 337 Yolk-Em Egg-Shade
No. 352 Navel Orange Shade
No. 351 Mandarin Orange Shade
No. 353 Blood Orange Shade
No. 371 Clover-Leaf Shade Green
No. 372 Pistachio Shade Green
No. 374 Creme-De-Menthe Shade (Green)

The colors are put up in 50-gallon barrels, 25-gallon barrels, 15 gallon kegs, 5-gallon kegs; 1-gallon, ½-gallon, and 1-quart bottles.

For quotations, see current price list.

B. Heller & Company's
MALABOZA
Reg. U. S. Pat. Off.
Vegetable Ice Cream Color

To Give a Cream-Like Color to the Regular Vanilla Mix

Permitted in All States

Heller's Malaboza Vegetable Ice Cream Color is a yellow liquid color to restore the natural cream color of the regular vanilla mix after other necessary ingredients have altered the color. It is an important factor in building up the business of the ice cream manufacturer. Without an artificial color, the product has a chalky cast unlike the color of ice cream as custom has established it.

Heller's Malaboza Vegetable Ice Cream Color does not produce a bitter taste when brought in contact with fruit acids, as do some other yellow colors. It is therefore a desirable color in fruit ices as well as in ice cream intended for use in ice cream sodas.

Heller's Malaboza Vegetable Ice Cream Color is a safe color, reliably uniform, The coloring matter contained in it is entirely of vegetable origin and contains no anilin.

NOTE: The commonly accepted color of New York or Neapolitan ice cream is more perfectly represented by our Malaboza Vegetable Ice Cream Color than by the usual egg shade. Simply use a little more of it than for the regular or Philadelphia mix.

It is packed in 55, 30, 20, and 10-gallon steel drums; and in 1-gallon jugs.

WRITE US FOR CURRENT PRICE LIST

B. HELLER & COMPANY'S

MALABOZA

Reg. U. S. Pat. Off.

ANILINE

Yellow Liquid Color for Ice Cream

To Give
A Cream Like Color
To The Regular
Vanilla Mix

Heller's Malaboza Liquid Color for Ice Cream is prepared specially for the artificial coloring of ice cream. The use of sugar, milk and other ingredients necessary to supply volume, reduces the natural cream color of the ice cream mix to a bluish, chalky shade. Common custom has established the cream color as a standard necessity, and ice cream makers find themselves compelled to defer to public demand by restoring the cream color with a harmless artificial color. It does NOT hide damage or inferiority.

Heller's Malaboza Liquid Color for Ice Cream mixes easily and evenly, giving the ice cream mix a rich, cream-like appearance which tends to promote the increased sale of ice cream. It is tasteless and odorless in the mix, and also dependably even in coloring quality. Its strength makes it economical to use.

The coloring matter used in Heller's Malaboza Liquid Color for Ice Cream has been **certified** as harmless to the U. S. Department of Agriculture.

Note: To impart an egg color to New York or Neapolitan ice cream or to frozen custards, a little more of the Liquid Color for Ice Cream is needed than for the regular or Philadelphia ice cream. Some prefer to use our Yolk-Em Egg Shade Yellow to color New York or Neapolitan ice cream.

It is packed in 50-gallon barrels, 25-gallon half-barrels, 15 and 10 gallon kegs, and 1-gallon jugs.

For quotations, see current price list.

B. HELLER & COMPANY'S

MALABOZA

Reg. U. S. Pat. Off.

VEGETABLE
Ice Cream Cone Color

IN DRUMS ONLY

PERMITTED IN ALL STATES

Heller's Malaboza Vegetable Ice Cream Cone Color is a specially prepared liquid color which gives a rich, appetizing, creamy appearance to ice cream cones, resulting in increased sales and profits for the ice cream dealer and for the cone baker.

It mixes readily with the batter and leaves no taste or odor of itself in the finished cones.

Heller's Malaboza Vegetable Ice Cream Cone Color is a vegetable color of uniform strength and quality. It is pure and harmless. The color of the baked cone made of rich batter is more perfectly represented by our Malaboza Vegetable Ice Cream Cone Color than by the usual egg shade. It is an economical color to use because it goes further, and is lower in price.

It is packed in 55 and 30-gallon steel drums.

WRITE US FOR CURRENT PRICE LIST

B. Heller & Company's

MALABOZA

(REG. U. S. PAT. OFF.)

ANILINE

Ice Cream Cone Color

Liquid Color

in

Drums Only

Heller's Malaboza Liquid Color for Cones is specially prepared to give a pleasing color to ice cream cones. Ice Cream served in cones does not tempt unless the cones themselves are rich and attractive in appearance. An unattractive cone can be the cause of the failure of superior ice cream.

Heller's Malaboza Liquid Color for Cones is soluble and mixes readily with the batter. It is tasteless and odorless in the batter and has coloring power of dependably uniform strength. It is therefore economical to use.

It is a compound of several colors each of which has been certified as harmless to the U. S. Department of Agriculture.

It is packed in 55 and 30-gallon steel drums.

FOR QUOTATIONS, SEE CURRENT PRICE LIST.

B. HELLER & COMPANY'S

MALABOZA

Reg. U. S. Pat. Off.

Special Ruby-Shade Red

Coloring Paste

Intensely Brilliant Red

Permitted in All States

Heller's Malaboza Special Ruby-Shade Red is the ideal coloring paste for ice cream, ices, sherbets, and other frozen products, when brilliant red is desired, a beautiful, clear, rich ruby red which does not readily fade.

This coloring paste is strong and very economical to use. It is also excellent for use in candy.

Heller's Malaboza Special Ruby-Shade Red contains no anilin and may be used under all pure food laws and regulations.

It is packed in 5-pound and 1-pound cans.

Write us for current price list.

B. HELLER & COMPANY'S
MALABOZA
Reg. U. S. Pat. Off.
Yolk-Em Egg-Shade Yellow

LIQUID OR DRY

General Purpose Egg-Shade Color

Heller's Malaboza Yolk-Em Egg-Shade Yellow is a favorite color of ice cream makers, cone makers, caterers, chefs, bakers and confectioners. It produces a rich, attractive egg shade commonly used to make New York or Neapolitan ice cream out of the regular vanilla mix. Products in which it is used are attractive to buyers and help to increase sales.

Yolk-Em is made in liquid or dry form. The coloring matter in it is derived from coloring that has been certified harmless to the U. S. Department of Agriculture. It complies with Federal and state laws wherever anilin food colors are permitted. It is economical to use.

LIQUID FORM

It is packed in 50-gallon barrels, 25-gallon half-barrels, 15-gallon kegs, 5-gallon kegs; 1-gallon bottles, ½-gallon bottles and 1-quart bottles.

DRY FORM

It is packed in 50-pound cans, 25-pound cans, 10-pound cans, 5-pound cans, and 1-pound cans.

For quotations, see current price list.

B. HELLER & COMPANY'S

OZO
Washing Powder

Cleans and Purifies

Saves Time and Cost

Ozo Washing Powder cuts milk fats and removes milk solids, leaving floors, walls, tables, vats, tubs, utensils, platforms, trucks and conveyers clean and purified. Its proper use by cleaning prevents sour odors in the freezing and hardening rooms and in the receiving, packing and shipping departments.

Ozo Washing Powder makes quick work of the necessary cleaning after the days run. It reduces the cost of labor spent on correct sanitation and so saves its own cost many times over. Its use is the mark of efficiency,

Ozo Washing Powder is harmless to hands and clothes. It attacks only dirt, leaving that degree of spotlessness which is demanded of the factory in which so dainty a product as ice cream is made and of the parlor in which it is sold.

It is packed in 2½-pound cartons and in 325 to 350 pound barrels.

Write us for current price list.

B. HELLER & COMPANY'S

Tru-White
Washing Powder

(REG. U. S. PAT. OFF.)

NON-LATHERING

Cleans and Purifies

Tru-White Washing Powder is an excellent article for general use around the ice cream plant. It cuts fatty accumulations and assists in keeping all utensils clean.

Tru-White Washing Powder is a necessity for washing vats, cans, pails, sanitary pipes and fittings, pasteurizers, homogenizers, viscolizers, emulsifiers, freezers, and hoppers.

Tru-White Washing Powder dissolves quickly, rinses out readily without affecting the taste and odor of the product, and leaves utensils and equipment sweet and wholesome. It attacks only fat and dirt, wherever it is used, and does not affect the hands, clothes or objects cleaned.

It is packed in 280-pound barrels, 100-pound, and 50-pound drums.

FOR QUOTATIONS, SEE CURRENT PRICE LIST.

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